THE CITY OF
WHITE PLAINS, NEW YORK

MULTI-HAZARD
MITIGATION PLAN

DRAFT
April 11, 2013

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SECTION: EXECUTIVE SUMMARY

Executive Summary

The City of White Plains, New York developed this Multi-Hazard Mitigation Plan in an effort to reduce future loss of life and property resulting from natural disasters. It is impossible to predict exactly when these disasters will occur, or the extent to which they will affect the City. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from natural disasters. Natural hazard mitigation may be defined as a method permanently reducing or alleviating the losses of life, property, and injuries resulting from natural hazards through long and short-term strategies. Example strategies include planning, policy changes, programs, projects, and other activities. Natural hazard mitigation is the responsibility of individuals, private businesses and industries, state and local governments, and the federal government.

Need for Mitigation Planning

This natural hazard mitigation plan is intended to assist the City of White Plains in reducing its risk from natural hazards by identifying resources, information, and strategies for risk reduction. It will also help to guide and coordinate mitigation activities throughout the City. The City did not receive any funds from the Hazard Mitigation Grant Program (HMGP) or the Federal Emergency Management Agency (FEMA) grant program to develop the plan. The City provided all funding for the plan's development.

Plan Organization

The Mitigation Plan contains background on the purpose of the plan, the methodology used to develop the plan, a profile of the City of White Plains, Risk Assessment on natural hazards that have the potential to impact the study area, and several appendices. The mitigation plan provides recommendations for activities that will assist the City in reducing risk and preventing loss from future natural hazard events. The action items address multi-hazard issues, as well as activities for the hazards of flood, severe weather, severe winter weather, extreme heat, earthquakes, drought, and dam failure.

Plan Participants

The City of White Plains recognized the importance of establishing a collaborative planning process to develop both short-term and long-term risk reduction strategies with strong ties to the existing programs and divisions of governance. Therefore, the City developed a planning committee comprised of individuals and specialists with natural hazard mitigation understanding and responsibilities from city departments, the schools, outside agencies and individuals from White Plains. The committee included representatives from the following organizations:

Police Department
Fire Department
Emergency Medical Services
Department of Public Works and Bureau of Engineering

Building Department
Planning Department
Legal Counsel
School District
Westchester County Office of Emergency Management
New York State Office of Emergency Management
Neighborhood Associations

What Will Be Accomplished

The City's vision related to emergency preparedness is to strive to create "A More Disaster Resistant Community." The planning committee further describes this vision: By creating a legacy of mitigation activities, City and community leaders' proactive implementation of long term, cost effective mitigation measures will serve to protect its population, its properties, its natural and built environment and its investments. The forethought of White Plains' leaders has preserved the City through decades of hazard events. The plan fosters coordinated partnerships and the development of strategies for reducing the risks posed by natural hazards.

City Goals

The plan describes the overall direction that the White Plains' agencies, organizations, and citizens can take to work toward mitigating risk from natural hazards. The City of White Plains plan was developed with significant input from the Hazard Mitigation Planning Committee. The principal mission is to reduce risk, prevent loss of property and commerce, and promote expedient recovery, while safeguarding people and the environment from natural disaster events through a coordinated and collaborative community partnership. This mission is implemented through the following five goals:

Goal #1	Protect Life and Property
Goal #2	Safeguard Critical Public Facilities and Infrastructure
Goal #3	Maintain and Enhance Emergency Response Capabilities
Goal #4	Protect the Environment
Goal #5	Increase Awareness and Preparedness

Action Items Developed

The following action items were developed for plan implementation:

- **Coordinating Organization:** The coordinating organization is the public agency with regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring, and evaluation. The coordinating organizations for all action items listed in this plan are departments within the City of White Plains.
- **Internal Partners:** Internal partner organizations are departments within the City that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.
- **External Partners:** External partner organizations can assist the City in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations. The internal and external

partner organizations listed in the mitigation plan are potential partners recommended by the planning committee, but who were not necessarily contacted during the development of the plan. Partner organizations should be contacted by the coordinating organization to establish commitment of time and or resources to action items.

- **Timeline:** Action items include both short and long-term activities. Each action item includes an estimate of the timeline for implementation. *Short-term action items (ST)* are activities which city agencies are capable of implementing with existing resources and authorities within one to two years. *Long-term action items (LT)* may require new or additional resources or authorities, and may take between one and five years to implement.
- **Levels of Immediate Capability:** The Hazard Mitigation Planning Committee prioritized the plan's five goals determining the most important as "Identifying the risk level and evaluating White Plains' vulnerability." The risk assessment identified various hazards that may threaten White Plains municipal facilities from low to severe. The step of prioritizing the action items and determining the ability for the City to immediately implement the action item was to review each action against availability of resources and funding. High – can immediately implement, Low – need a great deal of outside funding and resources with Medium landing somewhere in between.
- **Ideas for Implementation:** Each action item includes ideas for implementation and potential resources, which may include grant programs or human resources.
- **Plan Goals Addressed:** The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals following implementation.

Plan Implementation

The plan maintenance section of this document details the formal process that will ensure that the City of White Plains' Multi-Hazard Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing a plan revision every five years. This section describes how the City will integrate public participation throughout the plan maintenance process. Additionally, this section includes an explanation of how the City of White Plains intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as the Comprehensive Plan, Capital Improvement Plans, and Building Codes.

Plan Adoption

The White Plains Common Council will be responsible for adopting the City of White Plains' Multi-Hazards Mitigation Plan and providing the support necessary to ensure plan implementation. After the plan is adopted via resolution by the Common Council, the Commissioner of Public Works will be responsible for submitting it to the State Hazard Mitigation Officer at the New York State Emergency Management Office who will then submit the plan to the Federal Emergency Management Agency (FEMA–Region II) for review. This review will address the federal criteria outlined in FEMA Program Guidance. Upon acceptance by FEMA, the City of White Plains will gain eligibility for the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and Flood Mitigation Assistance program funds.

The effectiveness of the City of White Plains' Multi-Hazard Mitigation Plan will be contingent on the implementation of the plan and incorporation of the outlined action items into existing municipal plans,

policies, and programs. The Multi-Hazard Mitigation Plan includes a range of action items that, if implemented, would reduce loss from hazard events in the City of White Plains. Together, the action items in White Plains' Multi- Hazard Mitigation Plan provide the framework for activities that City's departments can choose to implement over the next five years. The Hazard Mitigation Planning Committee has prioritized the plan's goals and identified actions, which will be implemented, as resources permit, through existing plans, policies, and programs.

Coordinating Body

The Common Council, through the Commissioner of Public Works and a Committee will be the coordinating body for the mitigation plan. The responsibility has been established by the Common Council and includes representatives from applicable City Departments, including, but not limited to, the current Hazard Mitigation Planning Committee members. One of the Committee roles will be to review the mitigation plan annually and to oversee the update process. The Department of Public Works will be responsible for overseeing the plan's implementation. The Commissioner of Public Works will Chair the Committee to facilitate Multi-Hazard Mitigation Plan meetings. Plan implementation and evaluation will be a shared responsibility among all of the assigned Committee members.

Implementation through Existing Programs

The City of White Plains will addresses planning goals and legislative requirements through its comprehensive land use plan, capital improvement plans, city codes and an array of non-regulatory projects and programs. The Multi-Hazard Mitigation Plan provides a series of recommendations – many of which are closely related to the goals and objectives of existing planning programs. To the extent possible the City will incorporate the recommended mitigation action items into existing programs and procedures.

Economic Analysis of Mitigation Projects

The Federal Emergency Management Agency's (FEMA) methods of identifying the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity can assist the city in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Formal Review Process

The City of White Plains has developed a method to ensure that a regular review and update of the Multi-Hazard Mitigation Plan occurs. All Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan and the Commissioner of Public Works is responsible for contacting the Committee members and organizing the annual plan review meeting.

Continued Public Involvement

The City of White Plains is dedicated to involving the public directly in the continual reshaping and updating of the Multi-Hazard Mitigation Plan. The Committee members are responsible for the annual review and update of the plan. Commissioner of Public Works will continue to identify opportunities for the public's engagement in implementation and update of the plan. Public participation will continue to be invited through a series of presentations to the community as well as organizations such as neighborhood associations, utility companies and others. Copies of the plan will be posted on the City website and will be available there during the annual update periods. The website also contains contact information where people may direct questions and comments.

Contact Information

To request information or provide comments regarding this plan, please contact:

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SECTION 1: INTRODUCTION

Purpose

The primary purpose of this multi-hazard mitigation plan is to guide hazard mitigation planning to better protect the people and property of the City of White Plains from the effects of hazard events. It demonstrates the City's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. A secondary purpose is to make the City of White Plains eligible for federal disaster assistance, specifically, the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program as well as any other State or local government programs which may require as a pre-requisite the, the existence of such a plan.

Background and Scope

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses to insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many natural disasters are predictable, and much of the damage caused by these events can be alleviated or even eliminated.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2005).

Hazard mitigation planning is the process through which natural hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies to lessen impacts are determined, prioritized, and implemented. This plan documents the City of White Plains' natural hazards mitigation planning process, identifies relevant natural hazards and risks, and identifies the strategy to be used to decrease its vulnerability and increase its resiliency and sustainability.

The City of White Plains Multi-Hazard Mitigation Plan documents the City's natural hazards mitigation planning process, identifies natural hazards and associated risks to the city, and develops a hazards mitigation strategy to lessen vulnerability and improve resiliency to natural disasters, thereby enhancing the City's long-term sustainability. The City prepared this multi-hazard mitigation plan pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002 (44 CFR §201.6). (Hereafter, these requirements and regulations will be referred to collectively as the DMA.)

While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public

Law 93-288). Because the City of White Plains is subject to many kinds of natural hazards, access to these programs is vital.

This plan addresses natural hazards only. Although the White Plains Hazard Mitigation Planning Committee WPHMPC recognizes that FEMA encourages communities to address manmade and technological as well as natural hazards, the scope of this effort was limited to natural hazards for two reasons: 1) many of the planning activities for manmade and technological hazards are either underway or complete and were developed by a different set of organizations and 2) the DMA requires extensive public information and input, which is in direct conflict with the confidentiality necessary in planning for the fight against chemical, biological, and radiological terrorism. The WPHMPC determined it was not in the community's best interest to publicly share specific information about the area's vulnerability to manmade hazards. That being said, the plan references certain potential transportation related hazards which exist in the community and look to first responder organizations to further investigate the potential for such disasters in the community as well as develop response protocols under the Unified Command System.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to the City of White Plains and its property owners by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruption. White Plains has been affected by natural hazards in the past and is thus committed to reducing future disaster impacts and maintaining eligibility for federal funding.

Plan Organization

The City of White Plains' Multi-Hazard Mitigation Plan is organized as follows, with detailed descriptions provided in Chapter 3.

- Chapter 1: Introduction
- Chapter 2: Plan Adoption
- Chapter 3: Planning Process
- Chapter 4: City Profile
- Chapter 5: Risk Assessment
- Chapter 6: Mitigation Strategies
- Chapter 7: Plan Implementation Maintenance Procedures

Table 1-1 below shows the key Local Mitigation Plan elements as well as the Section in the Federal Register where detailed information may be found. The Table also shows the respective Chapter in the City's All Hazard Mitigation Plan where the information may be found.

Table 1.1 FEMA Local Mitigation Plan Review Crosswalk

Plan Criteria	Principal Location in Plan
Prerequisites	
Adoption by the Local Governing Body: 201.6 c (5)	Section 2
Planning Process	
Documentation of the Planning Process: 201.6 b and 201.6 c (1)	Section 3
Risk Assessment	
Identifying Hazards: 201.6 c (2) (i)	Section 5
Profiling Hazards: 201.6 c (2) (i)	Section 5
Assessing Vulnerability: Overview 201.6 c (2) (ii)	Section 5
Assessing Vulnerability: Addressing Repetitive Loss Properties: 201.6 c (2) (ii)	Section 5
Assessing Vulnerability: Identifying Structures 201.6 c (2) (ii) (A)	Section 5
Assessing Vulnerability: Estimating Potential Losses 201.6 c (2) (ii) (B)	Section 5
Assessing Vulnerability: Analyzing Development Trends 201.6 c (2) (ii) (C)	Section 5
Mitigation Strategy	
Local Hazard Mitigation Goals: 201.6 c (3) (i)	Section 6
Identification and Analysis of Mitigations Actions: 201.6 c (3) (ii)	Section 6
Identification and Analysis of Mitigations Actions (NFIP Compliance) 201.6 c (3) (ii)	Section 6
Implementation of Mitigations Actions: 201.6 c (3) (iii)	Section 6
Planning Maintenance Process	
Monitoring, Evaluation, and Updating the Plan: 201.6 c (4) (i)	Section 7
Incorporation into Existing Planning Mechanisms: 201.6 c (4) (ii)	Section 7
Continued Public Involvement: 201.6 c (4) (iii)	Section 7

Source: FEMA Multi-Hazard Mitigation Planning Guidance under DMA 2000, Part 3.
Local Multi-Hazard Mitigation Planning Guidance July 1, 2008

Benefits of Mitigation Planning

This planning process and the subsequent results will provide guidance for the City of White Plains, involved agencies both public and private and citizens and visitors to better prepare and respond when disasters occur. Mitigation planning along with subsequent reviews and updates allows the City to remain eligible for Federal, State and Local Mitigation Grant funding for projects designed to reduce the impact of future disaster events. Strategic benefits to preparing and updating the plan include; a better understanding of hazards and potential hazards to which the City is exposed, utilizing funding where the most positive impact on the community is likely to occur, potential savings by partnering with entities having a vested interest in the community, reduced strategic impacts and damages to persons and property, as well as creating a more disaster resistant community.

SECTION 2: PLAN ADOPTION

Plan Adoption

This section of the City of White Plains, New York Multi-Hazard Mitigation Plan outlines the process by which this plan will be formally adopted by the local governing body.

As plan chapters are completed as drafts the City will, having already discussed the process with the HMPC representative from the New York State Emergency Management Office (NYSEMO), submit them to NYSEMO to make sure all elements of DMA 2000 and other program requirements have been included.

Once the entire document has received a preliminary review by NYSEMO, and any items have been added/ revised, the plan will be placed of the City of White Plains' monthly Common Council Meeting Agenda for discussion and "Approval for Submission" to FEMA. The plan will then be submitted to FEMA through NYSEMO for "Approval Pending Adoption". FEMA may approve the document or return it to the City for revision. Final adoption of the Plan will take place following the receipt of FEMA's "Approval Pending Adoption".

In addition to being required by DMA 2000, adoption of the plan is necessary because:

- It lends authority to the plan to serve as a guiding document for local and state government officials;
- It gives legal status to the plan in the event it is challenged in court;
- It certifies to program and grant administrators that the plan's recommendations have been properly considered and approved by the governing authority and the jurisdiction's citizens; and
- It helps insure the continuity of mitigation programs and policies over time because elected officials, staff, ant other community decision – makers can refer to the official document when making decisions about the community's future.

Source: FEMA . August 2003. "How to Series"- Bringing the Plan to Life (FEMA 386-4).

Following receipt of FEMA's "Approval Pending Adoption" the Common Council will pass a resolution, approving the final plan document. A certified copy of the Common Council resolution adopting the plan will be submitted FEMA and the New York State Hazard Mitigation Officer (SHMO). FEMA will then provide a letter to the City indicating final acceptance of the plan.

SECTION 3: PLANNING PROCESS

Introduction

The City of White Plains recognized the need and importance of a multi-hazard mitigation plan and initiated its development. Facilitation and development of the plan included:

- Establishing a hazard mitigation planning committee (HMPC) as defined by regulations in the Disaster Mitigation Act of 2000 (DMA)
- Meet the DMA requirements as established by federal regulations and following the Federal Emergency Management Agency's (FEMA) planning guidance
- Facilitate the entire planning process
- Identify the data requirements that HMPC participants could provide and conduct the research and documentation necessary to augment that data
- Facilitating the public input process
- Produce the draft and final plan documents, and Coordinate the New York State Emergency Management Office and FEMA Region II plan reviews

Local Government Participation

The first order of business was to establish the Hazard Mitigation Planning Committee. The committee was established using the guidance provided in FEMA publication 386-1, Getting Started: Building Support for Mitigation Planning. The DMA planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Detail areas within the planning area where the risk differs from that facing the entire area
- Identify specific projects to be eligible for funding
- Have the governing board formally adopt the plan
- Fully participate in the process

For the City of White Plains HMPC members, "participation" meant:

- Attending and participating in the HMPC meetings
- Providing available data requested of the HMPC
- Reviewing and providing comments on the plan drafts
- Advertising, coordinating, and participating in the public input process
- Coordinating the formal adoption of the plan by the governing board(s)

The Planning Process

The City established the planning process for the plan using the DMA planning requirements and FEMA's associated guidance. This guidance is structured around a four-phase process which indicates the order in which individual chapters of the plan were developed:

1) Organize Resources
2) Assess Risks

3) Develop the Mitigation Plan
4) Implement the Plan and Monitor Progress

Table 3-1 shows how the expanded process fits into FEMA's four-phase process.

FEMA's 4-Phase Process	Expanded Process
1) Organize Resources	
201.6(c)(1)	1)Organize the Planning Effort
201.6(b)(1)	2) Involve the Public
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies
2) Assess Risks	
201.6(c)(2)(i)	4)Identify the Hazards
201.6(c)(2)(ii)	5) Assess the Risks
3) Develop the Mitigation Plan	
201.6(c)(3)(i)	6) Set Goals
201.6(c)(3)(ii)	7) Review Possible Activities
201.6(c)(3)(iii)	8) Draft an Action Plan
4) Implement the Plan and Monitor Progress	
201.6(c)(5)	9) Adopt the Plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan

Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

With the City of White Plains' commitment to participate in the DMA planning process, the City worked with the HMPC Committee Chairman to establish the framework and organization for development of the plan. The HMPC, which was comprised of key city staff and other local government and stakeholder representatives, developed the plan with leadership from the Department of Public Works – Engineering Bureau. The list of participating HMPC participants / municipal agencies included:

- Assessor
- Building
- Chief of Staff / Corporation Council
- Council of Neighborhood Association
- Environmental Officer
- Fire / Rescue / EMS
- Finance
- Information Technology/Geographic Information Systems
- Insurance Risk Manager
- Mayor
- Planning
- Police
- Public Works
- School District

Other Government and Stakeholder Representatives:

- Cablevision
- Consolidated Edison
- New York State Department of Environmental Conservation
- New York State Department of Homeland Security
- New York Power Authority
- Metropolitan Transit Authority
- TransCare
- Verizon Communications
- Westchester County Department of Public Works
- Westchester County Department of Emergency Services
- Westchester County Department of Public Safety
- White Plains Hospital

A full list of participants is available in Appendix G: Hazard Mitigation Planning Committee Members

The planning process officially began on December 3, 2012, and continued with a kick-off meeting on April 11, 2013 at City Hall. The meeting covered the scope of work and an introduction to the DMA requirements along with the anticipated level of participation of all member agencies. The HMPC met several times during the planning period (December 3, 2012 – June 3, 2013). The purpose and outcomes of these meetings is described in Table 3-2.

Table 3-2 Hazard Mitigation Planning Committee Schedule and Topics

HMPC	Topic	Date
1	Compilation of time for matching costs, identification of Hazards using Guidance from FEMA Document 386-1	December 3, 2012
2	Development of HMPC report on list of Hazards to be assessed, public participation process and individual elements	March 15, 2013
3	Kick-off meeting, introduction to the DMA, the planning process, discussion, question and answer	April 11, 2013
4	Review drafts of Introduction, Plan Adoption, Planning Process	T.B.D.
5	Finalize list of hazards. Begin assessment of identified hazards	T.B.D.

Agendas and minutes for each of the meetings and lists of attendees are on file with the City of White Plains Department of Public Works.

Planning Step 2: Involve the Public

The HMPC discussed options for public involvement and agreed to an approach using established public information mechanisms and resources within the community. Public involvement activities included an announcement at the May 6, 2013 meeting that City was in the process of developing the City's Hazard Mitigation Plan, that a committee had been established to prepare the plan document and that the public would be invited to participate and have input to the process. A questionnaire, for residences and businesses was prepared based on information provided in FEMA 386-1, "Getting Started, Building Support for Mitigation Planning". The questionnaire was placed on the City's website

on April 12, 2013. A public meeting was held at completion of the draft-plan on June 3, 2013. In addition, a letter was sent to all residents and businesses on May 31, 2013 announcing the City's development of the Hazard Mitigation Plan, continuing to solicit comments and inviting participation in the process by completing a questionnaire which was previously available at City Hall, the White Plains Public Library or online. When the draft document was completed, it was posted on the City website and the public was invited to comment on the drafts. Public comments from the questionnaire were compiled and made available to the HMPC. Where appropriate, stakeholder and public comments were incorporated into the final plan, including the sections that address mitigation goals and strategies. All website postings are on file with the City of White Plains Department of Public Works. The plan is available online at www.whiteplainsny.gov.

Planning Step 3: Coordinate with Other Departments and Agencies

Early in the planning process, the HMPC determined that data collection, mitigation strategy development, and plan approval would be greatly enhanced by inviting state and federal agencies and organizations to participate in the process. Based on their involvement in hazard mitigation planning, their landowner / proximity to the City, and/or their interest as a neighboring jurisdiction, representatives from the following agencies were sent a letter by the Commissioner of Public Works on April 12, 2013, announcing the start of the Hazard Mitigation Plan Development process and inviting them to participate.

- New York State Department of Transportation
- New York State Thruway Authority
- Town of North Castle
- Town of Scarsdale
- Town of Harrison
- Town of Greenburgh

In addition to those listed above, the HMPC used technical data, maps, reports, and studies from the following agencies and groups. The HMPC obtained this information either through the respective agency websites or directly from the organization.

- FEMA HAZUS MH
- National Oceanic and Atmospheric Administration
- U.S. Geological Survey
- Westchester County Department of Planning

Other Community Planning Efforts and Hazard Mitigation Activities

Coordination with other community planning efforts is also paramount to the success of this plan. Hazard mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability from natural hazards. The City of White Plains uses a variety of comprehensive planning mechanisms, such as a master plan, an emergency response plan, and municipal policies, to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this multi-hazard mitigation plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated where appropriate, information from the following existing plans, studies,

reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

- City of White Plains Master Plan
- City of White Plains Stormwater Management Plan
- US Army Corps of Engineers Section 905(B) Reconnaissance Study, Westchester County Streams, Westchester County, New York and Fairfield County, New York, July 2008 Final
- City of White Plains Zoning Regulations
- City of White Plains Planning Regulations
- City of White Plains Municipal Code
- City of White Plains Comprehensive Emergency Response Plan

Other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment.

Phase 2: Assess Risks

Planning Steps 4 and 5: Identify the Hazards and Assess the Risks

The HMPC conducted an exhaustive research effort to identify and document all the natural hazards that have, or could, impact the municipality. Data collection worksheets taken from FEMA Guidance document 386-1 were used in this effort to aid in determining hazards and vulnerabilities and where risk varies across the planning area. Geographic information systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities. The HMPC also conducted a capability assessment to review and document the municipality's current capabilities to mitigate risk and vulnerability from natural hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC can assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities previously identified. The City produced a draft during the planning steps for the HMPC to review in advance of the mitigation planning goals and strategy meetings. This draft contained the hazard identification and the entire risk assessment, containing the hazard identification, the vulnerability assessment, and capability assessment. A more detailed description of the risk assessment process and the results are included in Section 5: Risk Assessment.

Phase 3: Develop the Mitigation Plan

Planning Steps 6 and 7: Set Goals and Review Possible Activities

The City facilitated brainstorming and discussion sessions with the HMPC that described the purpose and the process of developing planning goals and objectives, a comprehensive range of mitigation alternatives, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. This information is included in Section 6: Mitigation Strategy.

Planning Step 8: Draft an Action Plan

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, the City produced a complete draft of the plan. This complete

draft was posted for HMPC review and comment on the web site. Other agencies were invited to comment on this draft as well. HMPC and agency comments were integrated into the final draft, which was advertised and distributed to collect public input and comments. AMEC integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the New York State Emergency Management Office and FEMA to review and approve, contingent on final adoption by the Common Council.

Phase 4: Implement the Plan and Monitor Progress

Planning Step 9: Adopt the Plan

In order to secure buy-in and officially implement the plan, the plan was adopted by the Common Council in a final draft format on June 3, 2013. A copy of the adoption resolution is included in Appendix A: Plan Adoption. Once the adoption is complete, formal approval by NYSEMO and FEMA can proceed.

Planning Step 10: Implement, Evaluate, and Revise the Plan

The true worth of any mitigation plan is in the effectiveness of its implementation. Up to this point in the planning process, all of the HMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing appropriate mitigation actions. Each recommended action includes key descriptors, such as a lead manager and possible funding sources, to help initiate implementation. An overall implementation strategy is described in Section 7: Plan Maintenance Procedures.

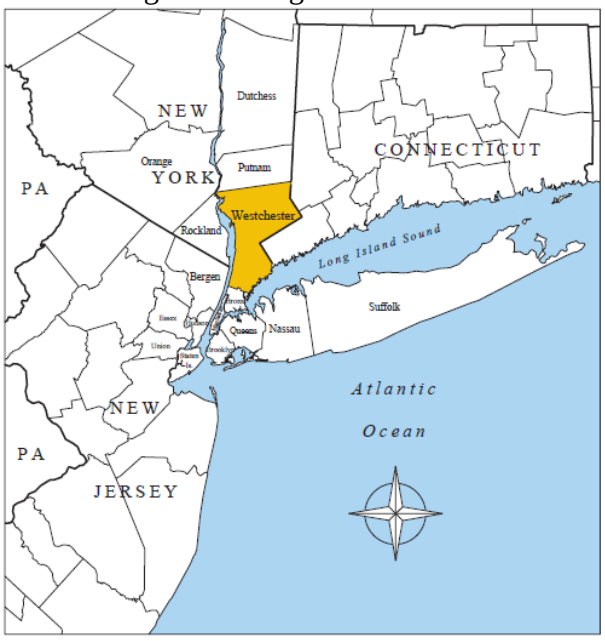
Finally, there are numerous organizations within the City whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is paramount to the ongoing success of this plan and mitigation in the City of White Plains and is addressed further in Section 6. A plan update and maintenance schedule and a strategy for continued public involvement are also included in Section 7.

SECTION 4: MUNICIPAL PROFILE

Overview

The City of White Plains is located in the center of Westchester County in New York State, approximately 30 miles north of New York City. Figure 4-1 shows Westchester County's location in the region. The City of White Plains is the county seat and the regional business center. The City is bordered to the west by The Town of Greenburgh and the Town of Scarsdale and to the east by the Town of Harrison. Figure 4-2 shows the City's location and its geographic relationship to other municipalities in the County. The City's latitude and longitude are: 41° 2′ 2″ N, 73° 45′ 47″ W (41.0338889, -73.7633333).

Figure 4-1 Regional Location



Source: Westchester County Data Book 2008

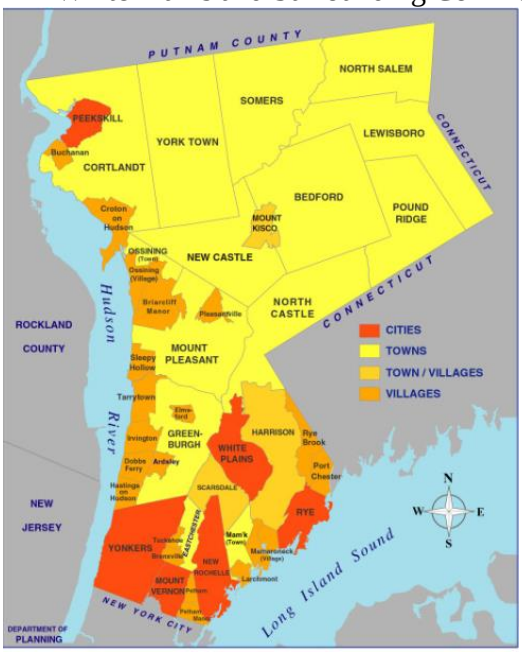
The City is 9.9 square miles or approximately 6336 acres in size. It is the third largest city in the County based on land area and has a population density of 5,361 per square mile. At the time of the last census in 2010, the City had a population of 56,853 which represented a 7.1% growth in the 10 years since the Census was conducted in 2000.

The City has a suburban character and is know both for its high quality residential neighborhoods as well as its lively downtown with an assortment of stores, restaurants and offices.

The City's central location made it easily accessible to one of the northeast corridor's major regional transportation networks including state, federal and county highways and parkways (I-684, the Cross Westchester Expressway/I-287, the Hutchinson River Parkway, and the Bronx River Parkway), the Harlem line of the Metro-North Railroad, a Westchester County Bee-Line bus station and Greyhound bus station, and close proximity to the Westchester County Airport. The combination of this

transportation system and demand, starting in the late 1960's – early 1970's, for more office space to house businesses that originally sought room to expand out of New York City, resulted in the development of large areas of corporate office complexes along the Cross Westchester Expressway/I-287 along the City's border with the Town of Harrison which became known as the Platinum Mile.

Figure 4-2 White Plains and Surrounding Communities



Source: Westchester County Data Book, 2008

Environmental Setting

The City is located in the Hudson Valley climate division of New York State. The seasonal temperature is typical of the northeastern United States with cold winters, mild springs, hot summers and mild falls. The average temperature in January is about 31 degrees F. and 77 degrees F. in July. Average rainfall in Westchester County is 45-50 inches per year. Average Westchester County snowfall is 40 -50 inches per year.

A major ridge line runs from north to the south, separating the Bronx River drainage basin from the Mamaroneck River drainage basin. Within the City there are two major subwatersheds: the Bronx River and the Mamaroneck River.

Areas within the FEMA designated 100 and 500 year flood plain for these two major drainage basins has been the location of severe and recurring flooding during storm events. Areas around the Bronx River and Mamaroneck River have been especially hard hit in recent years. A number of studies have been initiated by the City as well as other agencies in order to identify impediments and recommend structural and non-structural solutions. The City has also undertaken several flood control projects in order to help alleviate problems along the Bronx River. Recent reports include a Reconnaissance Study Site Visit and Report by the US Army Corps of Engineers that focused on areas along Bronx River and the Mamaroneck River impacted by the storms in the spring of 2007.

Although the primary purpose was not flooding, the City has participated in and endorsed two

intermunicipal watershed plans for the Long Island Sound known as WAC #4 and WAC #7. These plans were coordinated by Westchester County in 1997-1998 with the objective of controlling nonpoint source water quality pollution through structural and non-structural means. This provided a good basis for the City's preparation of a multi-faceted stormwater pollution prevention plan to comply with the federally mandated MS4 stormwater management regulations.

Figure 4-3 Environmental Features
Source: City of White Plains Comprehensive Plan

All or a portion of three NYS designated wetlands are located in the City. Many smaller sized wetlands areas are also located throughout the City and are regulated by a local wetlands ordinance. Many ponds and lakes of varying sizes are located throughout the City. Figure 4-3 identifies major environmental features.

Demographics

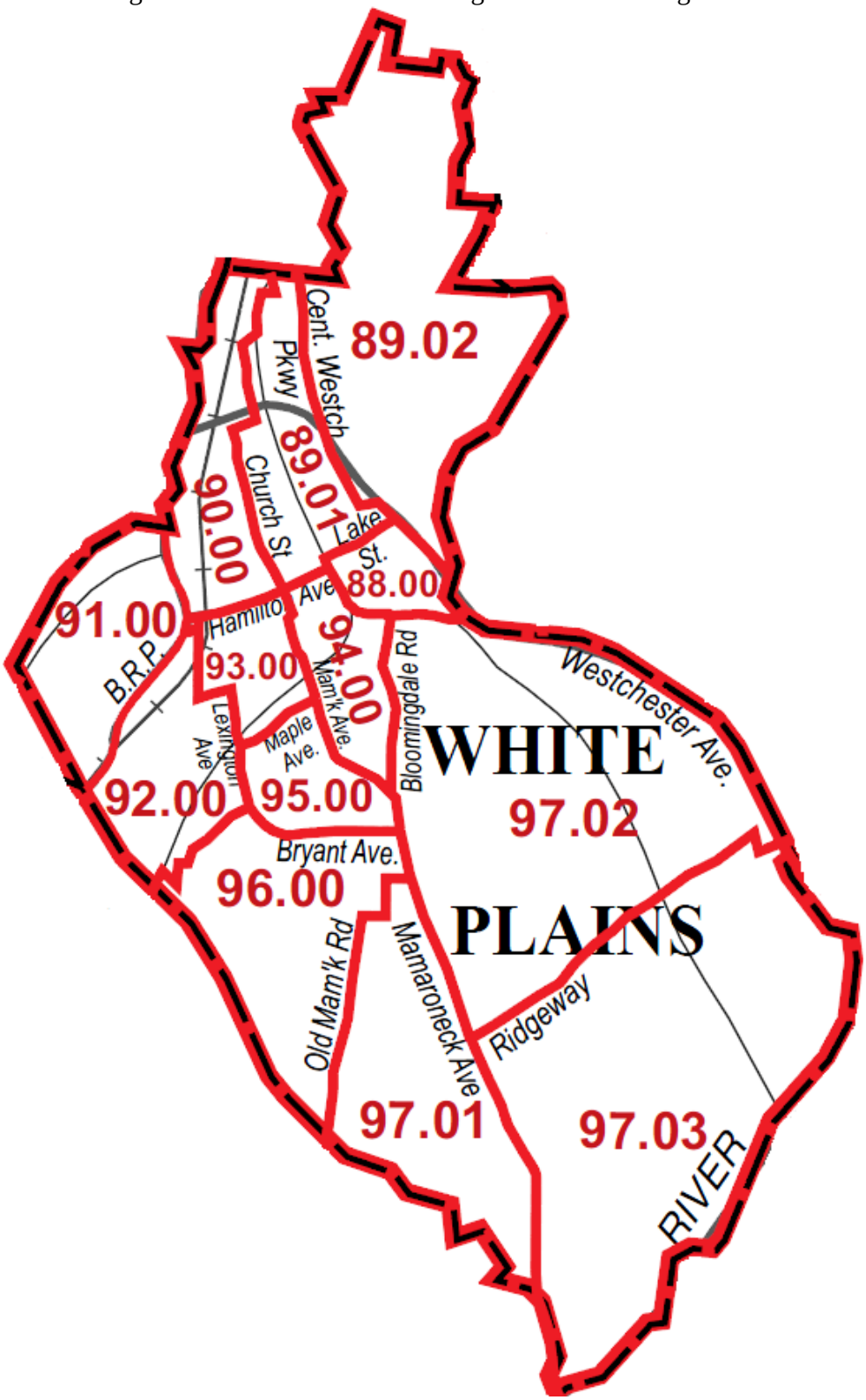
According to the 2010 U.S. Census, the City had a total population of 56,853. This represented a 7.1% increase in population from the 2000 census (53,077). By comparison Westchester County as a whole grew 2.8% between 2000 and 2010.

For the purposes of the Hazard Mitigation Plan (HMP), the City is using FEMA's HAZUS-MH risk assessment software program which relies on 2010 Census data. During the course of the preparation of the risk assessment and its evaluation of the findings, the HMP planning committee determined that the use of 2010 Census figures did not result in any material differences in the magnitude and impact of the identified potential losses.

The City's population is more affluent and better educated than the average for Westchester County. In 2010, the City's median family income was $76,164 as compared to $80,752 for the County. Approximately 87.2% of White Plains residents graduated from high school or higher with 46.7% of those residents having a college degree. For all City residents 16 years of age and older, 69% were employed in 2010 with 77.9% working in private industry, 13.2% in government, and 8.9% self employed. The occupation of the City's labor force was as follows: 47.4% in management, professional and related; 20.3% in services; 19.8% in sales and office; 6.5% in natural resources, construction, and maintenance; and 6.0% in production, transportation, and material moving.

Table 4-1 profiles selected demographic characteristics which provide useful information for the HMP. Because there are significant differences between areas of the City due to historical settlement patterns and development trends, the profile provides a comparison of neighborhood planning areas and the City as a whole. The neighborhood planning areas are those identified in the City's Comprehensive Plan Update Draft: Downtown White Plains, Southern White Plains (the area south of Downtown) , Northern White Plains (the area north of Downtown), Western White Plains (the area west of the Bronx River). These areas generally correspond with three of the thirteen census tracts which cover the City. The location of these census tracts is shown in Figure 4-4.

Figure 4-4 Census Tracts and Neighborhood Planning Areas



Source: Westchester County Census Tracts 2000 (www.westchestergov.com)

Table 4-1 Selected Demographic Characteristics by Census Tract

Data	White Plains Total	88.00	89.01	89.02	90.00	91.00	92.00	93.00	94.00	95.00	96.00	97.01	97.02	97.03
Population %	100													
Population Change 2000-2010														
Density (person/sq.mile)														
% White Alone														
% Black or African American														
% Asian Alone														
% Hispanic (any race)														
Median Age														
% 1 Person Households														
Median Family Income														
% Making $25,000 or less														

Source: US Census Bureau

The Disaster Mitigation Act of 2000 (DMA 2000) requires that HMPs consider what are termed "socially vulnerable" populations. These populations can be more susceptible to hazard events, based on a number of factors including their physical and financial ability to react or respond during a hazard, and the location and construction quality of their housing. This HMP considers three socially vulnerable population groups:

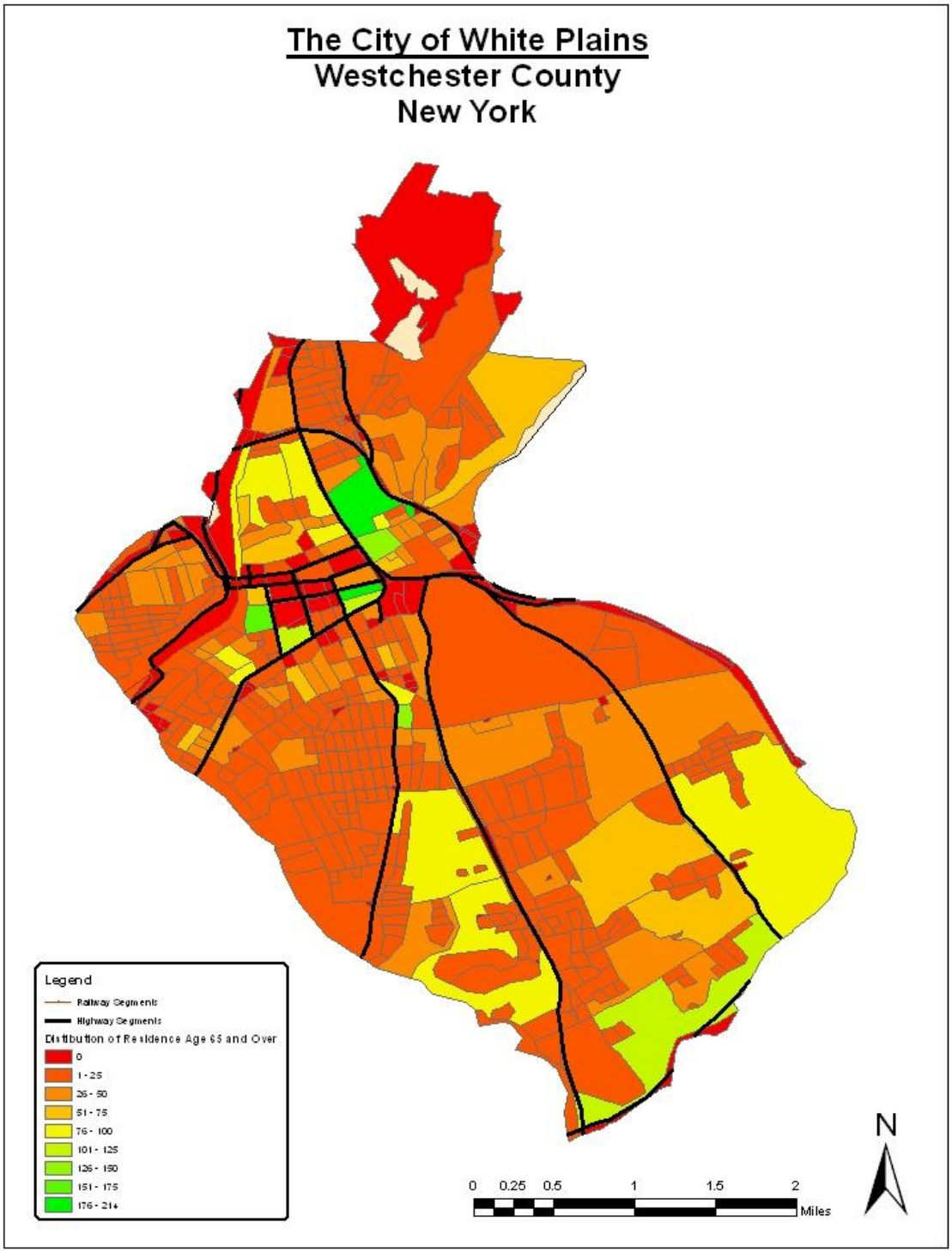
- seniors (persons over the age of 65);
- low-income (household annual income below $25,000 a year); and
- language difficulties (limited or no ability to speak English).

According to 2010 census, there were 8,672 White Plains residents age 65 years or older (15.3% of the total population). Of this number approximately 2,789 (12.2%) lived alone. The census estimated that 7.4% of these seniors had incomes below the poverty level in 2010.

The 2010 Census identified 3,907 of the total 24,080 households in White Plains or 17.1% as having an annual income of $25,000 or less. The Census also found that 6.9% of family households had incomes below the 2010 Poverty Level.

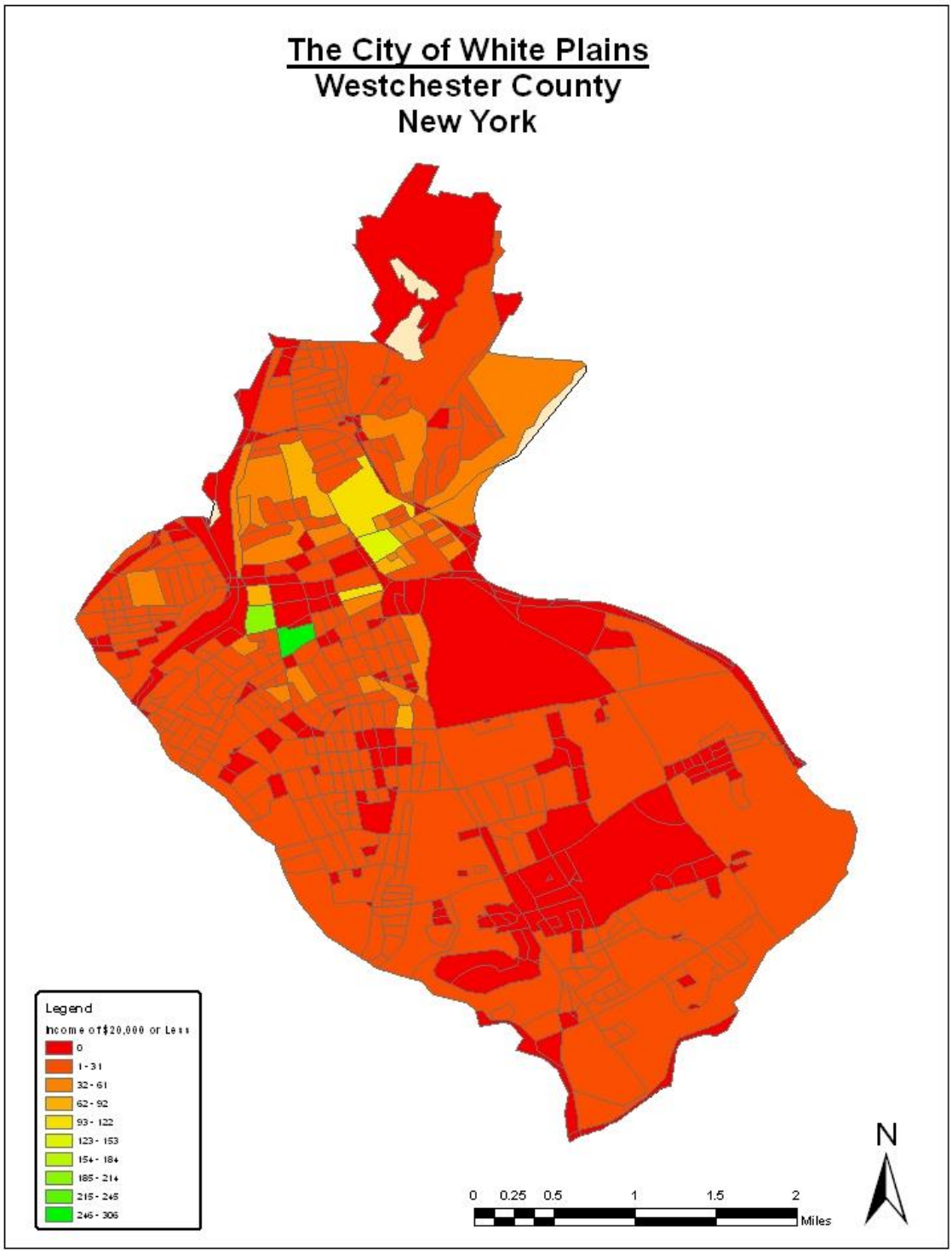
The 2010 Census found that 16.8% (8,935) of White Plains residents aged 5 years and over (53,109) identified their ability to speak English as less than very well. Approximately 4.6% (1,055) indicated that they spoke English "not well" or "not at all". There were 1,414 individuals or 6.7% of total population in households that defined as "linguistically isolated". A linguistically isolated household is one in which no member 14 years old and over (1) speaks only English or (2) speaks a non-English language and speaks English "very well." In other words, all members 14 years old and over have at least some difficulty with English.

Figure 4-5 Distribution of Residents Age 65 or Older



Source: HAZUS-MH

Figure 4-6 Distribution of Residents with Annual Incomes of $20,000 or Less



Source: HAZUS MH

Figure 4-7 Distribution of Residents Who Speak English Less Than Very Well
Source: US Census 2000 Summary File 3 (SF-3) Sample Data

Housing

There were 24,382 total housing units in the City in 2010 which represented a 16.5% increase (3,461 units) from 2000. Of these units 12,326 were owner occupied (53.8%) and 10,584 (46.2%) were occupied by renters. Approximately 34.3% of all housing units were single family (detached or attached).

Data provided by the US Census Bureau, New Residential Construction Statistics prepared by the Westchester County Department of Planning reveals that between 2000 and 2007, 564 residential building permits were issued in White Plains. A high of 117 permits were issued in 2002 followed by a steep drop off in succeeding years with 50 permits issued in 2007. This number may stay steady or decline further due to current local, regional and national economic conditions.

The age, type, value, and density of housing units can have important implications for hazard management planning. Table 4-2 highlights these characteristics.

Table 4-2 Selected Housing Characteristics by Census Tracts
City of White Plains and Neighborhood Planning Areas

Housing	White Plains Total	88.00	89.01	89.02	90.00	91.00	92.00	93.00	94.00	95.00	96.00	97.01	97.02	97.03
Total Units	23,382													
Single Family (Detached or Attached) (% of Total Units)														
2 Family (% of Total Units)														
20 or More Units (% of Total Units)														
Year Built: 1939 or Earlier (% of Total Units)														
Year Built: 1990-1999 (% of Total Units)														
Median Value (Owner Occupied)														

Source: US Census Bureau 2010

Business and Commercial Uses

In 2006, White Plains was the location of over 1,500 business establishments employing approximately 34,000. While approximately 57% of these businesses were small in size employing four (4) or fewer employees, White Plains is also the home of five (5) private employers in Westchester County with 500 or more employees. Major corporate office complexes were drawn to the City because of its central location in the county with ready access to major highways, rail lines and the Westchester County Airport. Office parks are mainly found along the region's "Platinum Mile" (Cross Westchester

Expressway/I-287). Table 4-3 is an inventory of major businesses and employment sites with 500 or more employees.

Table 4-3 Businesses & Employment Sites with 500 or More Employees, 2008

Company Name	Number of Employees	Specific Industry
White Plains Hospital Center	1,300	Office & Clinics of Doctors of Medicine
Starwood Hotels	700	Hotels & Real Estate Investments
IBM	700	Computer Peripheral Equipment, n.e.c.
Burke Rehabilitation Hospital	550	General Medical & Surgical Hospitals
Bloomingdale's	500	Department Stores (excl. leased depts.)

Source: Westchester County Data Book 2010

Office development is not only a major economic asset to the City but is also important to the regional, State, and in some instances national economy as a whole. Office development is also a major land use in the City with twenty five sites have buildings 100,000 square feet or more in size.

Land Use

The City of White Plains prepared a Comprehensive Plan Draft that was released in 2006. The 2006 Plan Draft is still in process but it provides an overview of generalized land use patterns that is still germane to the hazard mitigation planning process. Much of the data and analysis included in that section of the Plan has been summarized below.

The City contains approximately 6,326 acres. Generalized land uses fall into one of 9 categories as shown on Figure 4-8.

Figure 4-8 Land Use and Neighborhoods
Source: The City of White Plains Comprehensive Plan 2006 Draft

Residential

Residential land uses account for approximately 45% of all land in the City. Of this amount, approximately 56% are single family dwellings although there is a range of housing types within that category. Most residential uses are predominately low density, with two or less dwelling units per acre comprising about 70% of the residential area. What the Comprehensive Plan Update Draft 2006 terms "large lot suburban" is found throughout the town but predominates in southern White Plains. These homes were built generally in the 1950s. Smaller lot single family homes from the 1960s and 1970s are found throughout the City. Two family homes are also found throughout the City.

Low scale garden apartments built in the 1960's can be found throughout White Plains. Higher density (4-6 stories) multi-family family apartments are located around White Plains with high rise apartments located in the Downtown area as well as residences over retail shops.
The small lot residential and higher density housing found in White Plains have been impacted by frequent natural hazard storm events and the severe flooding that often accompanies it.

Retail

Small scale retail centers primarily serving local residents are situated in downtown White Plains in the central business district. A few isolated retail establishments can also be found on throughout White Plains. Some of the retail establishments in throughout White Plains have been subject to repeated flooding from storm events.

Office
In addition to the belt of commercial offices and office parks along Westchester's "Platinum Mile" South of the Cross Westchester Expressway/I-287, areas of office buildings are located in downtown White Plains. Some smaller office buildings as well as professional offices converted from residences are located throughout the White Plains.

Open Space and Recreation
Approximately 2,179 acres are devoted to public or private open space and recreational uses. There are almost 82 acres of City owned parks with LIST PARKS HERE. There are six other smaller public parks and playgrounds scattered throughout the City. LIST Recreation Center HERE. Two private country clubs comprising approximately 200 acres are located in whole or part in the City. One public golf course comprising approximately 1,200 acres is located partly within the City

Institutional
Institutional uses include nine public schools; White Plains High School, White Plains Middle School, Rochambeau School, and six elementary school; Mamaroneck Avenue School, Eastview School, Post Road School, Ridgeway School, Church Street School, George Washington School.

There are also nine private schools; Archbishop Stepinac High School, Our Lady of Sorrows School, German School, Solomon Schechter School, Ridgeway Nursery School & Kindergarten, Windward School, Kodomono Kuni, Academy of Our Lady of Good Council Academy, and New York Hospital Annex.

There are four College/Universities located within the City: Pace University Campus Law School, Pace University Lubin Center, Berkley College and Mercy College.

Vacant
Vacant land accounts for almost 6% of all land uses. Vacant land is primarily situated in northern White Plains, and areas with severe natural constraints in White Plains.

A breakdown of the approximate 6,326 acres of the major land use categories is shown in Table 4-4.

Table 4-4 – Generalized Land Use 2006

Use	Approximate Acreage	Percent
Residential		
Commercial, Retail & Office		
Instituational/Recreation & Open Space		
Vacant		
Circulation		
Water Supply		
Cemetery		
Water Bodies		
Total	**6,326**	**100.0**

Source: The City of White Plains Comprehensive Plan 2006 Draft

Zoning

There are 30 zoning districts in the City.

These include 16 residential districts. They comprise of 5 single family residence districts; 2 one and two family residence district; 1 townhouse district; and 1 planned senior residential development zone.

There are 13 business districts in the City. Business districts including four core business districts; 2 business residential districts; 1 campus office district; 1 office-residential district; 1 restricted business district;1 neighborhood business district; 1 intermediate business district; 1 urban renewal central business district; and 1 enclosed mall district.

There is 1 Industrial District in the City designated as Light Industrial.

Future Development

The City's 2006 Comprehensive Plan 2006 Draft examined land use trends and identified properties and areas with future development potential. A copy of the future land use plan prepared as part of the plan is shown in Figure 4-9.

Figure 4-9 Future Land Use
Source: The City of White Plains Comprehensive Plan 2006 Draft

This information was reviewed with the City Planner and the Planning Committee. The following are some of the future areas that could be the subject of new or redevelopment proposals.

1. LIST AREAS FOR FUTURE DEVELOPMENT HERE

Figure 4-10 Significant Properties
Source: The City of White Plains Comprehensive Plan 2006 Draft

Critical Facilities

HAZUS separates critical buildings and facilities into five categories based on their loss potential as follows:

Essential Facilities are crucial to the health and welfare of the whole population and are especially important following hazard events. Essential facilities commonly include police, fire and EMS stations, hospitals & other medical facilities, emergency operation centers, evacuation shelters, and schools which serve as shelters or feeding stations in an emergency.

Transportation Systems include airports, major roadways, bridges and tunnels, railways and waterways.

Lifeline Utility Systems such as potable supply systems, sewerage treatment facilities, oil, natural gas, electric power and communication systems.

High Potential Loss Facilities would have a high loss associated with them and include nuclear power plants, dams, and military installations.

Hazardous Waste Facilities house industrial or hazardous materials such as corrosives, explosives, flammable materials, radioactive materials, & toxins.

Emergency Facilities

The White Plains Police Department serves the entire City. The police station is located on South Lexington Avenue at the corner of Martine Avenue. The Department is staffed by 202 career professionals.

The White Plains Fire Department serves the entire City. There are seven Fire Houses located throughout the City. The Department is staffed by 160 career professionals.

FS #1 – Old Mamaroneck Road
FS #2 – Ferris Avenue
FS #3 – Warren Street
FS #4 – South Lexington Avenue (Special Operations)
FS #5 – Robertson Avenue (Volunteer Division)
FS #6 – Mamaroneck Avenue (Headquarters)
FS #7 – North Street

TransCare, stationed out of FS #2, has been contracted by the City to provide ambulance services with both basic and advanced life support. They operate ____ ambulances and ____ utility vehicles with a staff of _____ EMT and ____ Paramedics.

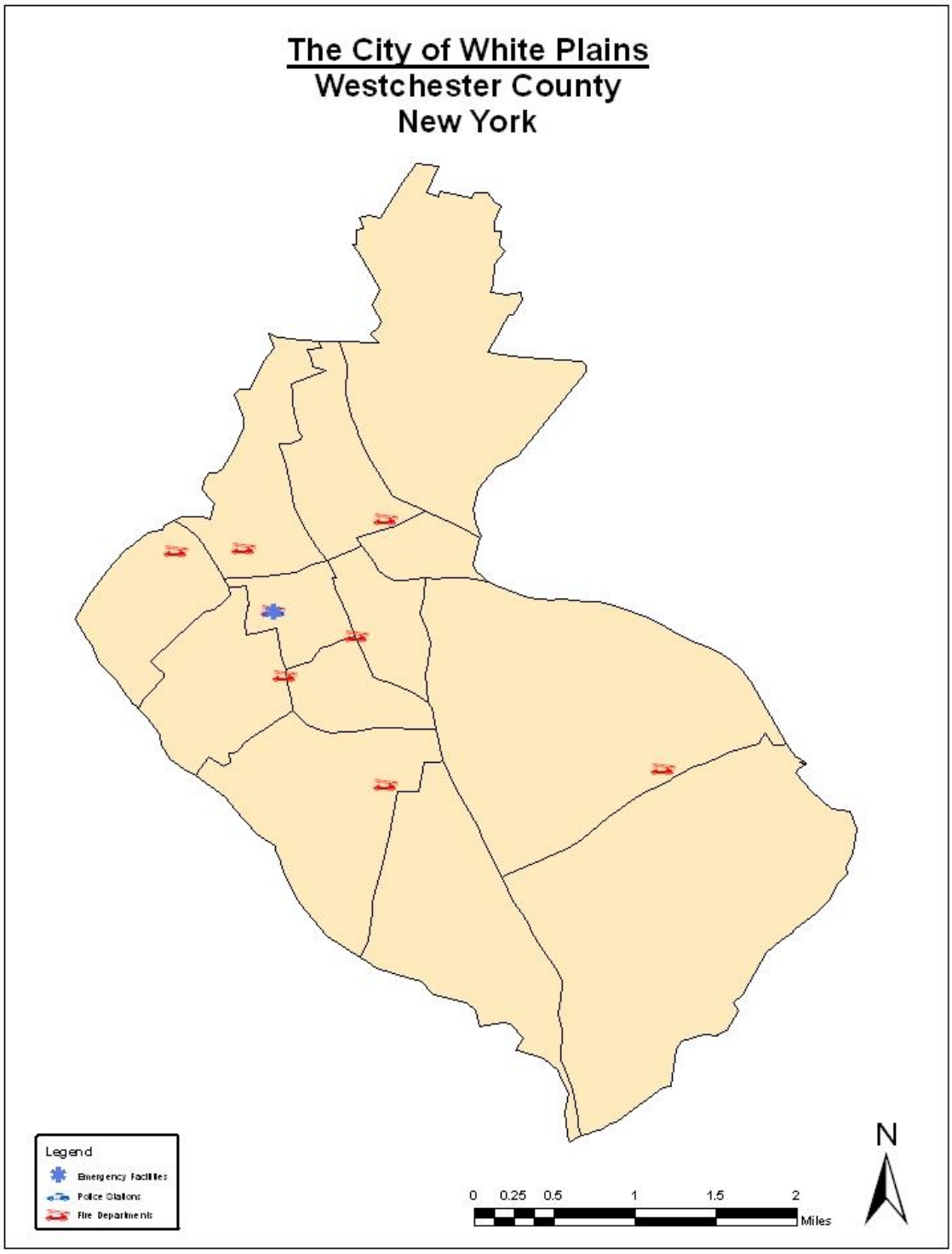
Table 4-5 is an inventory of the City's emergency facilities and Figure 4-11 shows their location.

Table 4-5 Emergency Facilities Inventory

Facility Name	Address	Structural Value	Content Value	Building Type	Occupancy/ Capacity	Backup Power
Police Station	77 South Lexington Ave					Stand-By
FS #1	93 Prescott Ave					Portable
FS #2	20 Ferris Ave					Stand-By
FS #3	2 Terrace Ave					Portable
FS #4	232 South Lexington Ave					Portable
FS #5	49 Robertson Ave					Portable
FS #6 (HQ)	219 Mamaroneck Ave					Stand-By
FS #7	663 North St					Portable

Source: The City of White Plains, HAZUS-MH

Figure 4-11 Emergency Facilities in the City of White Plains



Source: HAZUS-MH

The Westchester County Department of Emergency Services, located in Valhalla, New York provides comprehensive training for City personnel in the operation of the Hazardous Material Response Team (HAZMAT).

The Town's Police, Fire, and Ambulance Provider share communication channels during Emergencies. During the course of many natural hazard events, the City's Department of Public Works is called upon to play an important role in assisting emergency responders. As a result, the Planning Committee determined that Public Works facilities should also be included in this category as "Other Emergency Response Related Facilities." An emergency command center is located at Fire Station #2.

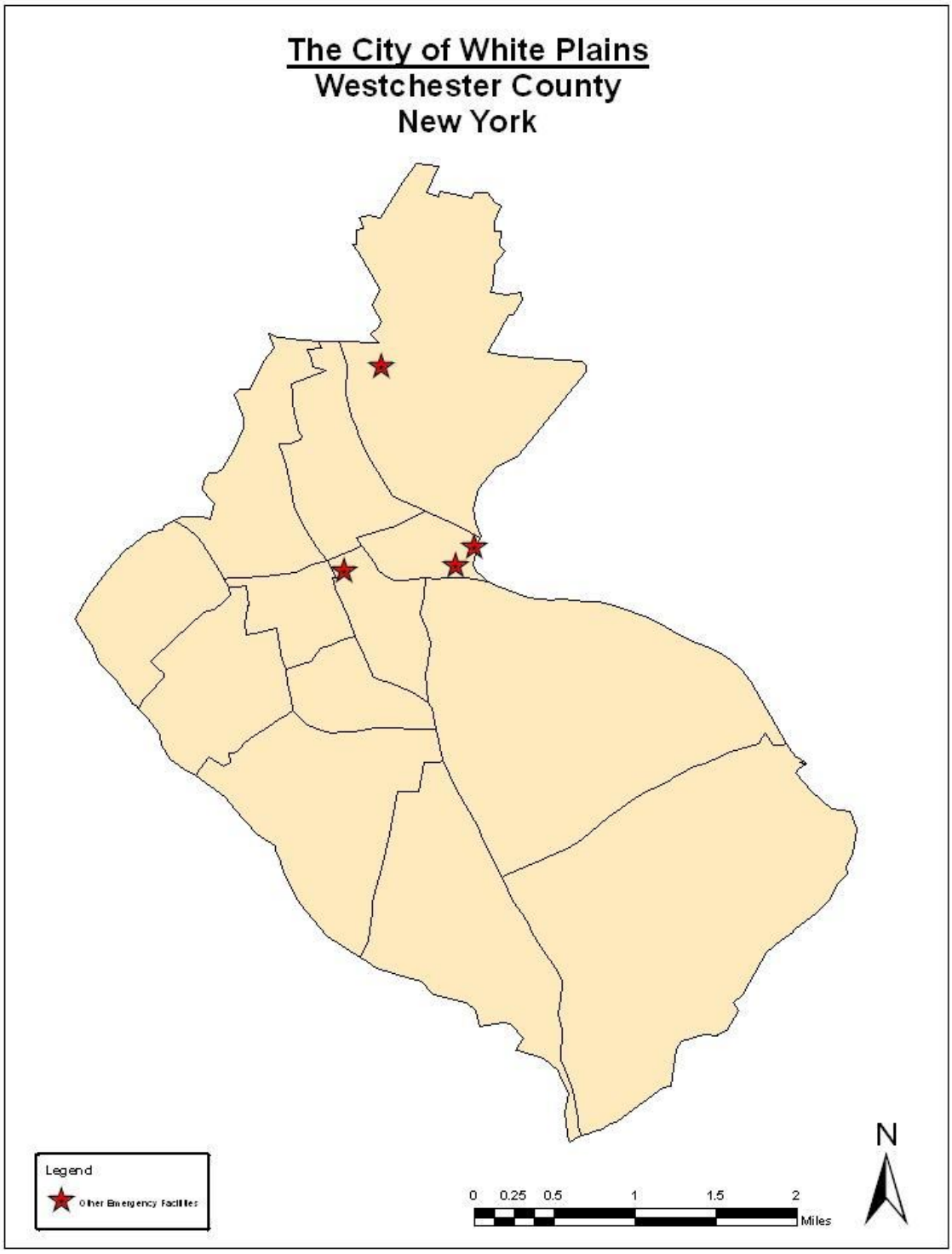
Table 4-6 is an inventory of those facilities and Figure 4-12 shows their location.

Table 4-6 Other Important Emergency Response Related Facilities

Facility Name	Address	Structural Value	Contents Value	Building Type	Occupancy/ Capacity	Backup Power
City Hall	255 Main Street					N
DPW Garage	240 South Kensico Avenue					Stand-By
Garage & Shop	77 Brockway Place					Stand-By
Orchard Street Pump Station	240 Orchard Street					Stand-By

Source: Local Data, HAZUS-MH

Figure 4-12 Other Important Emergency Response Related Facilities



Source: HAZUS-MH

Hospitals and Medical Centers

There is one general care hospital located within the City - White Plains Hospital Center (292 beds-community general). Other medical facilities within the City are Burke Rehabilitation Hospital (150 beds) and New York-Presbyterian/Westchester Division (270 beds). Other hospitals that are in close proximity to the City are Westchester Medical Center (635 beds – acute care and level 1 trauma center), Greenwich (174 beds – community general) and Sound Shore Medical Center (471 beds – comprehensive care).

Shelters

American Red Cross shelters are located on West Post Road and North Broadway and designated Stay Cool Center locations are announced as they are needed. There are also homeless shelters located at Grace Church Community Center, Samaratian House and Coachman Family Center.

Schools

The City is served by the White Plains School District. There are nine schools in the district:
White Plains High School, White Plains Middle School, Rochambeau School, and six elementary school; Mamaroneck Avenue School, Eastview School, Post Road School, Ridgeway School, Church Street School, George Washington School.

There are also nine private schools located in the City: Archbishop Stepinac High School, Our Lady of Sorrows School, German School, Solomon Schechter School, Ridgeway Nursery School & Kindergarten, Windward School, Kodomono Kuni, Academy of Our Lady of Good Council Academy, and New York Hospital Annex.

There are four College/Universities located within the City: Pace University Campus Law School, Pace University Lubin Center, Berkley College and Mercy College.

Table 4-7 is an inventory of educational facilities in the City and Figure 4-13 shows their location.

Table 4-7 Educational Facilities in the City of White Plains

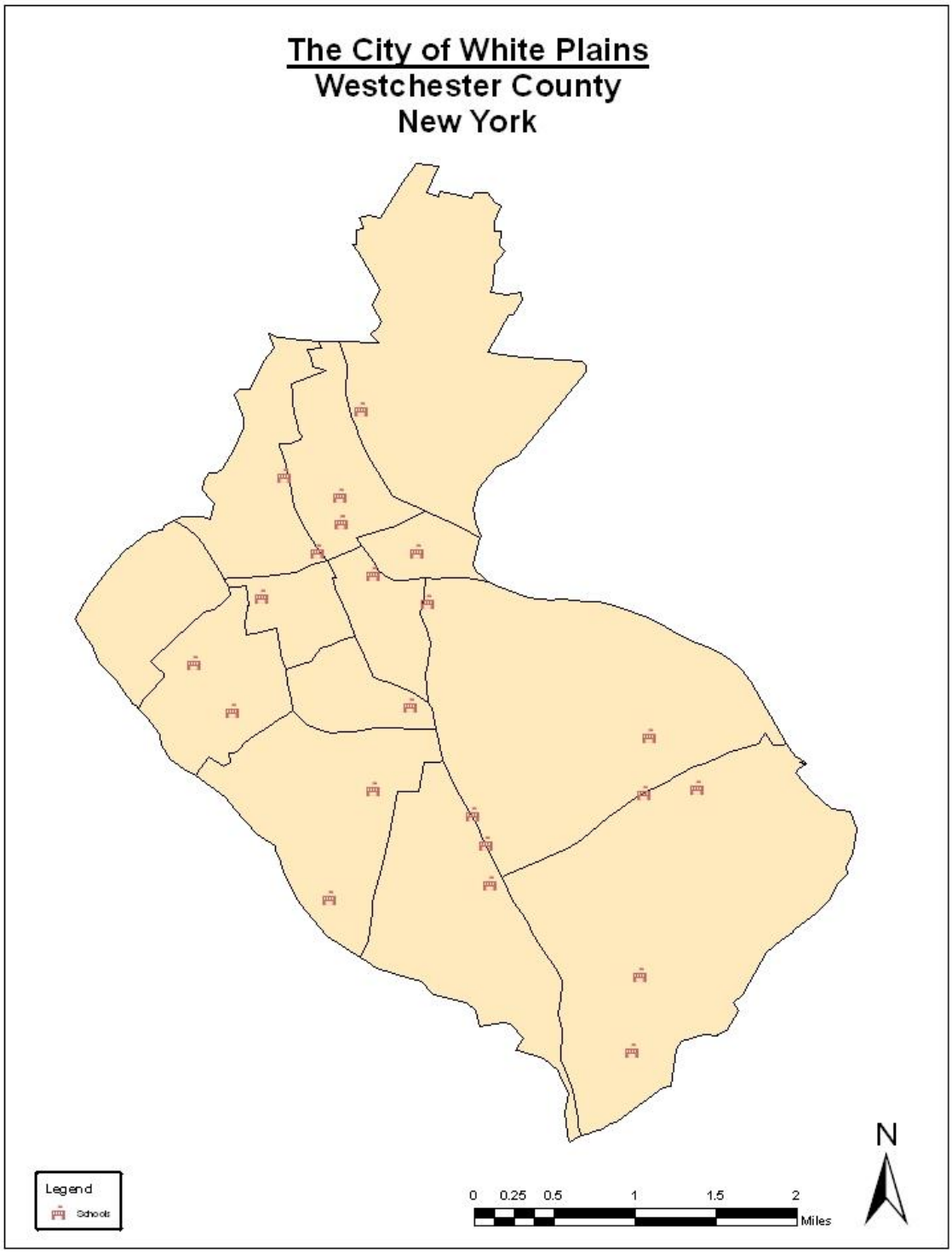
Facility Name	Address	Type of Facility / Grade Range	Enroll-ment	Designated Shelter (Y/N)	Shelter Capacity	Structural Value	Content Value	Bldg. Type	Backup Power (Y/N)
George Washington School	100 Orchard Street	Public K-5	645						
Church Street School	295 Church Street	Public K-5	617						
Mamaroneck Avenue School	7 Nosband Avenue	Public K-5	596						
White Plains Middle School (Highview)	128 Grandview Avenue	Public 6-8	1735						

White Plains Middle School (Eastview)	350 Main St	Public 6-8	500						
Post Road School	175 West Post Road	Public K-5	487						
Ridgeway School	225 Ridgeway	Public K-5	662						
White Plains Senior High School	550 North Street	Public 9-12	2042						
Rochambeau School	228 Fischer Ave	Public 9-12	225						
Archbishop Stepinec High School	950 Mamaroneck Ave	Private 9-12	583						
Our Lady Of Sorrows School	888 Mamaroneck Avenue	Private K-8	203						
Academy Of Our Lady Of Good Council	52 North Broadway	Private 9-12	320						
Academy Of Our Lady Of Good Council	52 North Broadway	Private PreK-8	156						
Windward School	13 Windward Ave	Private 1-4 and 5-9	328						
German School New York	50 Partridge Rd	Private K-12	375						
Kodomono Kuni	252 Soundview Ave	Private 3-6yrs	38						
Ridgeway Nursery School & Kindergarten	465 Ridgeway	Private 2yr-K	23						
Solomon Schecter School of Westchester	30 Dellwood Rd	Private K-5	396						
Pace University Law School	78 North Broadway	Private Law	855						
Pace University Lubin Center	1 Martine Ave	Private Grad.	2,868						

Berkley College	99 Church St	Private Under Grad.	700						
Mercy College	277 Martine Ave	Private Under Grad.							
New York Hospital Annex	21 Bloomingdale Road	Private	59						

Source: HAZUS-MH, Local Data

Figure 4-13 Educational Facilities in the City of White Plains

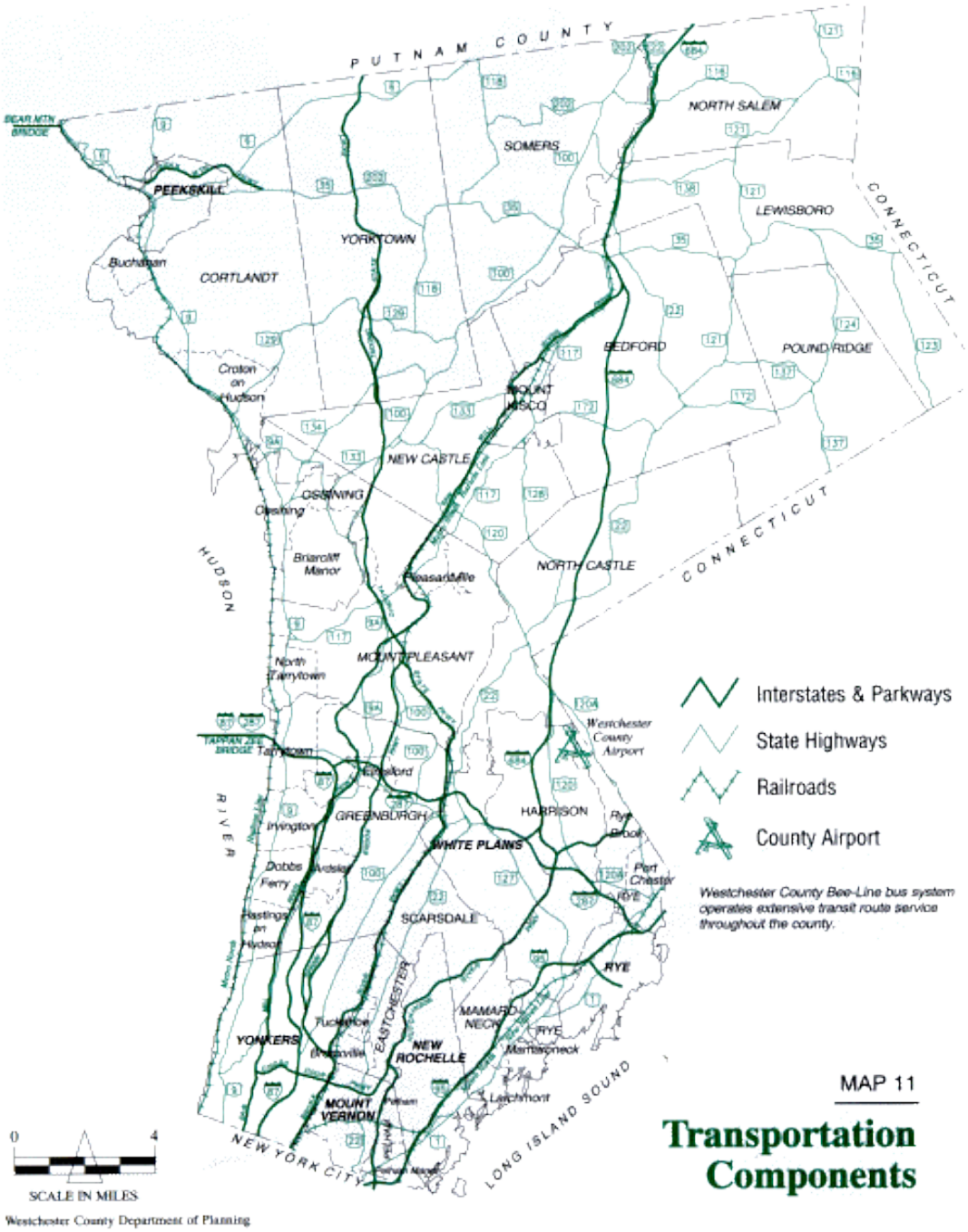


Source: HAZUS-MH

Transportation Systems

The transportation network located within the City's boundaries is composed of limited access, arterial and local roads, a rail line and two stations, and a bus station. Figure 4-14 shows the regional transportation network in Westchester County.

Figure 4-14 Westchester County Transportation Network



Source: Westchester County Department of Planning
(http://co.westchester.ny.us/patterns/MAP/maps.htm)

There are approximately 143 miles of roads in the City. According to 2005 New York State Department of Transportation (NYSDOT) centerline highway mileage jurisdiction for Westchester County approximately 112 miles fall under the jurisdiction of the City, approximately 25 miles are Westchester County's, and approximately 6 miles are owned by NYSDOT and NYS Thruway. The Department of Public Works maintains the City's roads, including line striping, street light maintenance, and cleaning of gutters, catch basins, and the storm sewer system. The annual road-paving program includes paving approximately 5 to 10 miles of roads and the winter snow removal program addresses 143 miles of roadways.

Portions of four major limited access highways travel through the City and surrounding communities:

The Cross Westchester Expressway (I-287), the Hutchinson River Parkway and the Bronx River Parkway. These highways serve not only the New York metropolitan area but also the northeast U.S. According to data NYS DOT data, volume on two of these highways exceeds 101,000 vehicles a day.

Arterials are designed to carry traffic between White Plains and surrounding communities. Mamaroneck Avenue (County Road #8A & #8B), a 4 lane road just north of the Mamaroneck generally situated between the Hutchinson River Parkway interchange and Downtown White Plains, Westchester Avenue (County Road #62,the I-287 east-west service road), Central Park Avenue (NYS Route 100), North Street (NYS Route 127), Tarrytown Road (NYS Route 119), North Broadway (NYS Route 22), Post Road (NYS Route #22), and Old Mamaroneck Road (NYS ROUTE 125) are the major arterials in the City. There are a number of minor arterials and collector streets including Lake Street, Chatterton Parkway, Soundview Ave, Ridgeway, and Bryant Ave.

Downtown White Plains is served by the Metro-North commuter railroad, Harlem Line, with frequent service to Grand Central Station in New York City. According to the 2010 Census, almost 20% of the City's workforce commutes by public transportation. The average shortest peak morning commute time to New York Grand Central Station is 36 minutes. Commuter parking is available adjacent to the train station.

According to Metro North Railroad 2007 data, the average daily weekday ridership from the White Plains Station was 9,285 with 3,653 boarding during the AM peak.

White Plains is served by the Westchester County Beeline bus line. Most routes through White Plains come from or travel to surrounding community.

In close proximity to the City is the Westchester County Airport. It is a county-owned light general aviation airport which serves commercial, corporate, and private aircraft. The airport handled over 176,500 flight operations in 2007, of which 49% were corporate, 24% were commercial, and 27% were general aviation. There are 7 commercial airlines which fly out of the airport. A number of commercial flights have been cut back recently due in large part to fuel costs. Since 1985 commercial traffic at the airport has been restrained by operation of a Terminal Capacity Agreement. These restrictions were further extended and signed into Westchester County law in 2004 into what is known as the Terminal Use Regulation. This limits the number of passengers and the number of flights to four flights per half hour (either arriving or departing). A Voluntary Restraint from Flight (VRFF) agreement is also in place, which applied to the hours between 12 midnight and 6:30 pm. On average the total number of passenger that passed through the terminal per year is over 1.9 million. The airport operates light general aviation and corporate aviation with over 310 aircraft based there. According to the Westchester County Data Book 2008, the airport serves more corporate fleets than any airport in the

world with 550 corporate flights a day. The Airport covers approximately 702 acres. The airport is an important economic asset to the county and the region.

Figure 4-15 Road Hierarchy in the City of White Plains
Source: The City of White Plains Comprehensive Plan 2006 Draft

Lifeline Utility Systems

The White Plains Department of Public Works provided data for potable water tanks, pumping stations and information on sanitary sewer systems.

Potable Water Supply

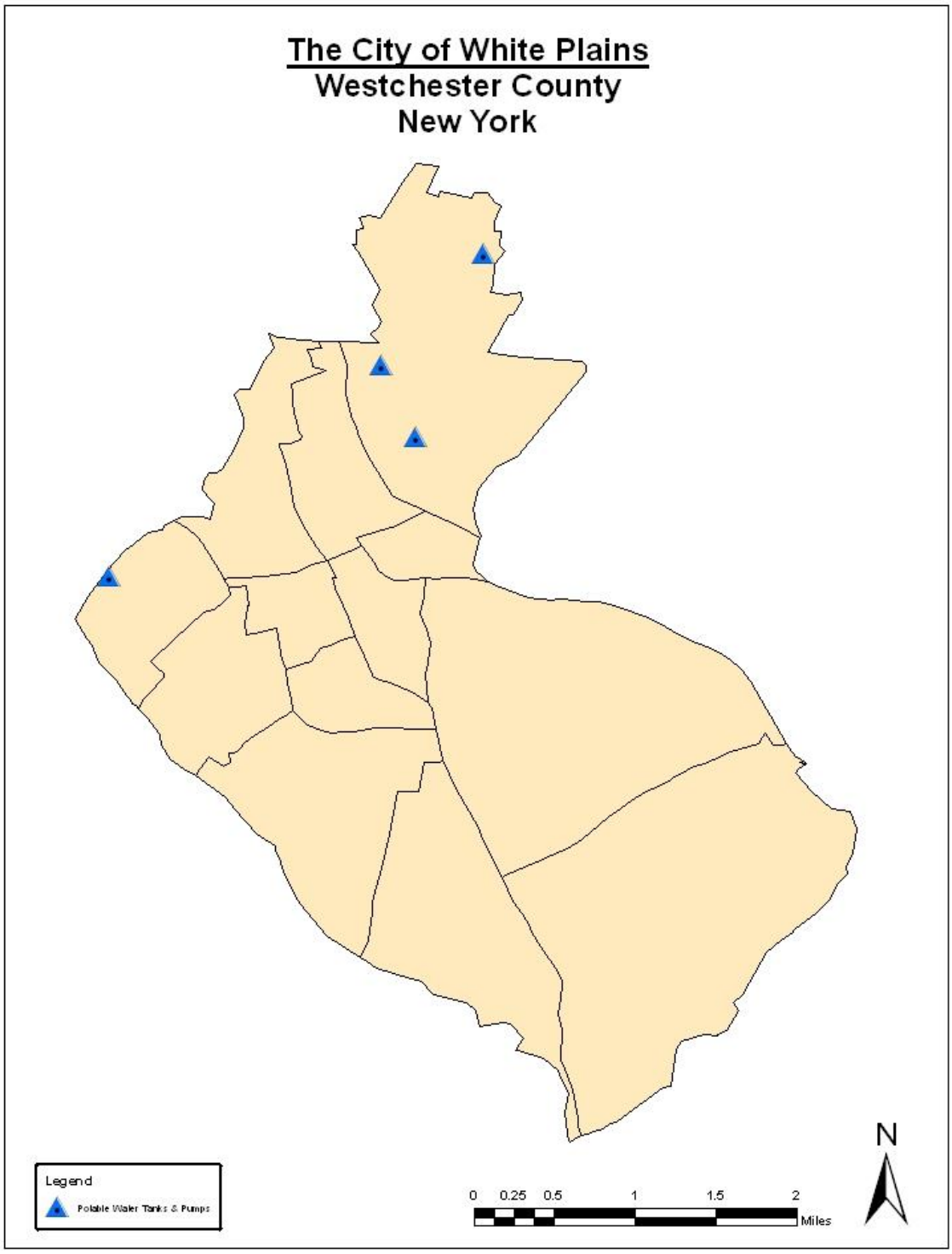
The City is served by one water district which is operated by The City of White Plains – Department of Public Works – Water Bureau and serves approximately 10,000 domestic customers. The Department of Public Works – Water Bureau also provides service to the firefighting facilities (e.g. fire hydrants) throughout the City. White Plains water comes from two City reservoirs, municipal wells, and the Kensico Reservoir which is part of the New York City water supply system. The Department of Public Works – Water Bureau operates one storage tank, two pump stations, and a booster station in the City. There are also four wells which are rated for a total of 150 MGD that are currently out of service. The Department of Public Works – Water Bureau is also responsible for maintaining the water distribution system. Table 4-8 is an inventory of the water tanks and pump stations owned and operated by The Department of Public Works – Water Bureau in the City and Figure 4-16 shows their location.

Table 4-8 Potable Water Tanks & Pumps – The City of White Plains

Facility Name	Capacity	Supply Capacity	Structural Value	Backup Power
Orchard Street Pump Station	20 MGD	8.5 MGD		Stand-By
Central Avenue Pump Station	20 MGD	8.5 MGD		Portable
Concrete Storage Basin	9.25 Million Gallons	-		N/A
Hall Avenue Booster Pump	MGD	MGD		

MGD = Million Gallons Per Day
Source: The City of White Plains – Water Bureau

Figure 4-16 Potable Water Tanks & Pumps – The City of White Plains



Source: The City of White Plains – Water Bureau

Wastewater Facilities

White Plains is served by two county sewer districts: Mamaroneck and Bronx Valley.

The eastern portion of White Plains is served by the Bronx Valley sewer district. The western and southern portion of White Plains is served by the Mamaroneck sewer district. There are also a few houses that are still on septic systems. The City of White Plains Department of Public Works maintains the sanitary sewer system including the repair and cleaning of the collection system and one pump station. Table 4-10 provides an inventory of the City's pump stations and Figure 4-17 shows their location.

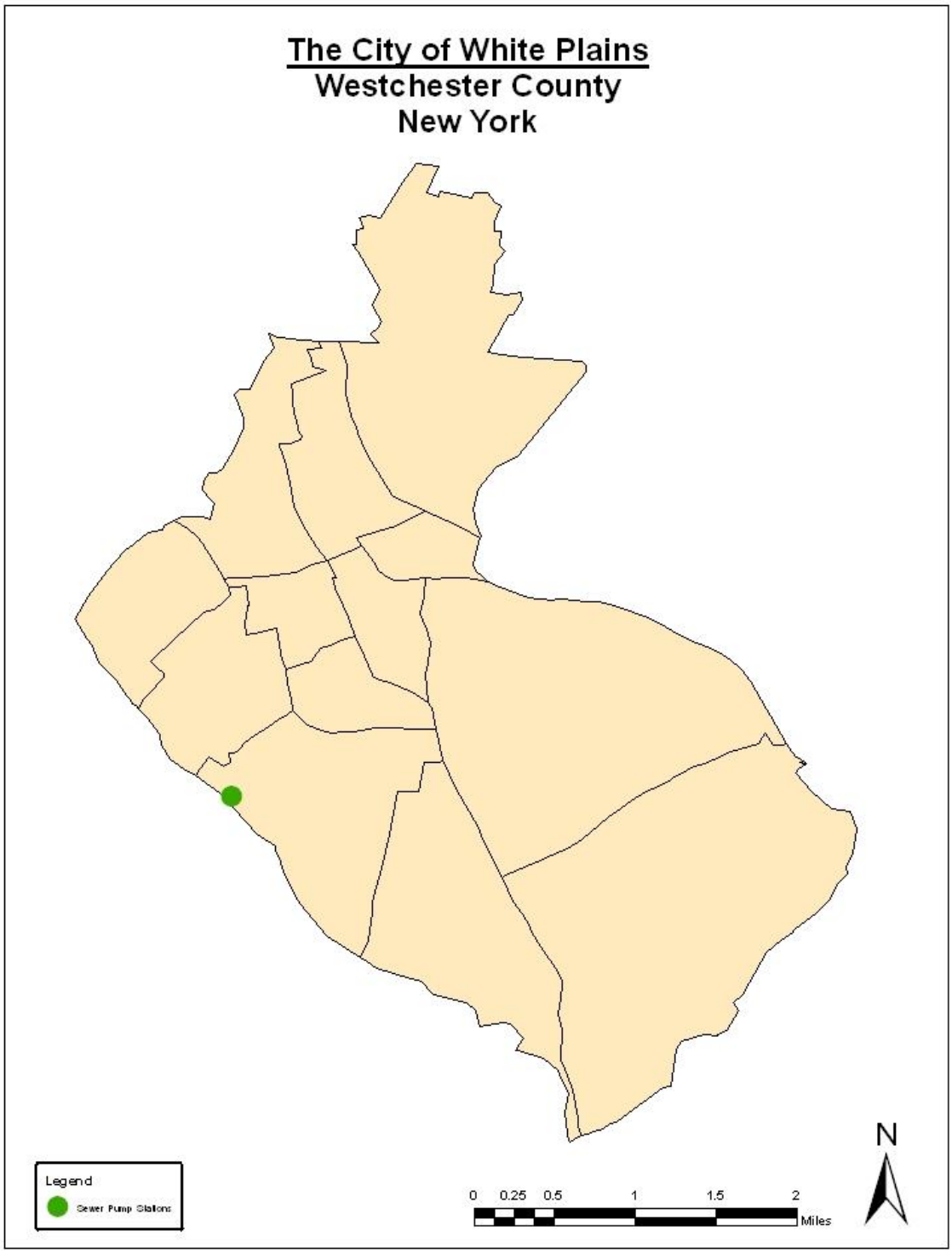
Table 4-9 Sewer Pump Stations – The City of White Plains

Facility Name	Service Area	Structural Value	Rate (GPM)	Average Daily Flow (GPD)	Backup Power
Winslow Road Pump Station	White Plains		330		None

GPM = Gallons Per Minute; GPD = Gallons Per Day

Source: The City of White Plains Engineering & DPW Departments

Figures 4-17 Sewer Pump Stations – The City of White Plains



Source: The City of White Plains DPW

Electrical Power Facilities
Electrical power is transmitted and distributed by Consolidated Edison (Con Ed) throughout the entire City and most of Westchester County. The HAZUS-MH provided data identifies one (1) electric substation in the City and there are no electrical power generating facilities in the City.

Fuel and Natural Gas Pipelines
Natural gas is supplied to the City by Con Ed. The HAZUS-MH provided data identified one (1) natural gas transmission pipeline infrastructure in the City.

High Potential Loss Facilities are defined by FEMA as having a high loss associated with them such as nuclear power plants, dams and military installations. None of these types of facilities are located in White Plains.

Hazardous Waste Facilities house industrial/hazardous materials such as corrosives, explosives, flammable materials, radioactive materials and toxins. None of these types of facilities are located in White Plains.

SECTION 5: RISK ASSESSEMENT

Risk Assessment

Requirement §201.6(c)(2):
The risk assessment shall provide the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

Methodology

As defined by the Federal Emergency Management Agency (FEMA), risk is a combination of hazard, vulnerability, and exposure. "It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage."

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction's potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

This risk assessment followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses* (2002), which breaks the assessment down to a four-step process:

1) Identify Hazards
2) Profile Hazard Events
3) Inventory Assets
4) Estimate Losses

Data collected through this process has been incorporated into the following sections of this chapter:

- **Section 5.1: Identifying Hazards** identifies the hazards that threaten the planning area.
- **Section 5.2: Profiling Hazards** discusses the threat to the planning area and describes previous occurrences of hazard events and the likelihood of future occurrences.
- **Section 5.3: Assembling Vulnerability** assesses the City's total exposure to natural hazards, considering assets at risk, critical facilities, and future development trends.

5.1 Identifying Hazards

Requirement §201.6(c)(2)(i):
The risk assessment shall include a description of the type of all natural hazards that can affect the jurisdiction.

The HMPC, conducted a hazard identification study to determine the hazards that threaten the planning area.

Tools

To address the requirements of DMA 2000 and understand potential vulnerability and losses associated with the hazards of concern, the City used standardized tools, combined with local, state and federal data and expertise to conduct the risk assessment. Using existing natural hazards data and input gained through planning meetings, the HMPC agreed upon a list of natural hazards that could affect the City of White Plains.

Multi-Hazard (HAZUS)

FEMA has developed a standardized model for estimating losses caused by earthquakes, known as Hazards U.S. or HAZUS. HAZUS was developed in response to the need for more effective national, state, and community level planning and the need to identify areas that face the highest risk and potential for loss. HAZUS was expanded into a multi-hazard methodology, HAZUS-MH with new models for estimating potential losses from wind (hurricanes) and flood (riverine and coastal) hazards. HAZUS-MH is a Geographic Information System (GIS)-based software tool that applies engineering and scientific risk calculations that have been developed by hazard and information technology experts to provide defensible damage and loss estimates. These methodologies are accepted by FEMA and provide a consistent framework for assessing risk across a variety of hazards. The GIS framework also supports the evaluation of hazards and assessment of inventory and loss estimates for these hazards.

HAZUS-MH uses GIS technology to produce detailed maps and analytical reports that estimate a community's direct physical damage to building stock, critical facilities, transportation systems and utility systems. To generate this information, HAZUS-MH uses default HAZUS-MH provided data for inventory, vulnerability, and hazards; this default data can be supplemented with local data to provide a more refined analysis. Damage reports can include induced damage (inundation, fire, threats posed by hazardous materials and debris) and direct economic and social losses (casualties, shelter requirements, and economic impact) depending on the hazard and available local data. HAZUS-MH's open data structure can be used to manage community GIS data in a central location. The use of this software also promotes consistency of data output now and in the future and standardization of data collection and storage. The guidance *Using HAZUS-MH for Risk Assessment: How-to Guide* (FEMA 433) was used to support the application of HAZUS-MH for this risk assessment and plan. More information on HAZUS-MH is available at http://www.fema.gov/hazus. HAZUS – MH was used to assess potential exposure and losses associated with hazards of concern for the City.

HAZUS-MH was applied using HAZUS-MH software and associated tools to estimate losses associated with the flood and hurricane hazards. HAZUS-MH support was used to evaluate other hazards, where possible. For most of the hazards evaluated in this risk assessment, historic data is not sufficient to model future losses at this time. However, HAZUS-MH can map hazard areas and calculate exposures if geographic information on the locations of the hazards and inventory data is available. For some of the other hazards of concern, areas and inventory susceptible to specific hazards were mapped and exposure was evaluated to help guide mitigation efforts discussed in Chapter 6. For other hazards, a qualitative analysis was conducted using the best available data, professional judgment

and knowledge of the community over time. This approach was applied to all hazards of concern to the City.

In addition, this approach was applied to the non-hurricane components of the severe storm hazard. For this risk assessment, the loss estimates, exposure assessments, and hazard-specific vulnerability evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their affects on the built environment.

Where HAZUS-MH data conflicts with locally obtained information, the local information shall be verified and utilized in the plan where appropriate. Where such data discrepancies exist, a notation shall be made referencing such discrepancy.

Identification of Hazards of Concern

In order to initially identify what hazards may exist in the study area; the Westchester County CEMP (version November 2005) and the 2008 New York State Multi-Hazard Mitigation Plan were consulted. The Westchester County CEMP utilized the Hazards New York (HAZNY) software provided by NYSEMO to score and classify the potential hazards to which Westchester County as a whole is exposed (450 square mile area and a population of approximately 950,000). The hazards ultimately identified by the City of White Plains correspond to some extent with those identified by the Westchester County CEMP although in some cases with differing classifications. These differing classifications exist due to the differing levels of response and recovery between these two levels of government. The 2008 New York State Multi-Hazard Mitigation Plan, while viewing hazards from a statewide perspective, provided information on specific hazards which were determined to be of concern in the study area.

The City of White Plains HMPC considered the full range of hazards that could impact the area and then identified and ranked those hazards presenting the greatest concern. The basis for the determination involved the utilization of Worksheet #1 in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses* (2002). This Worksheet, coupled with additional research of local, state and federal databases on frequency, magnitude and potential for occurrence by the HMPC resulted in identifying the hazards most likely to impact the community and thus requiring further analysis. In some cases, the FEMA Region II Hazard Mitigation Toolkit, available on the internet was consulted for direction and formatting.

Because of similar characteristics and reporting criteria, certain hazards were combined.

The Hazard Identification was completed over the course of several meetings with the HMPC.
The first step was to provide the HMPC with a listing of the potential hazards (Worksheet 1) along with instructions on how to proceed. The first meeting Hazard Identification meeting was held on April 11, 2013 and included discussion on each of the Hazards indicated on Worksheet # 1. The discussion included personal knowledge of the HMPC. A preliminary list of potential hazards was developed, and the HMPC was to provide a database search on the potential hazards identified and make a report to the HMPC at the xx/xx/xxxx meeting. Table 5.1 below lists all the Hazards of Concern and whether or not a significant threat exists to the City of White Plains.

Table 5.1 Hazards of Concern

Hazard of Concern	Potential for Hazard to occur in Study Area?	If Yes, does Hazard pose a Significant Threat	Reason for Determination	Source of Information
Avalanche	No	No	Study area does not have topography for such an event	Input from HMPC and Study Area DPW
Coastal Erosion	No	No	Study area has no coast line	Municipal Map
Coastal Storm	Yes	Yes	Study area lines within 3 mile of Long Island Sound	FEMA Disaster Records, NYSEMO HMP
Dam Failure	Yes	Yes	4 dams located in study area and 1 dam located outside study area	NYSDEC, DPW Database
Drought	Yes	Yes	Identified in NYSEMO HMP, Identified by HMPC	NOAA, NCDC, NYCDEP Database NYSEMO HMP
Earthquakes	Yes	Yes	Identified in NYSEMO HMP, identified by HMPC	USGS Earthquakes Hazard Program, Lamont Cooperative Seismographic Network, NYSEMO HMP
Expansive Soils	No	No	No history of such an event, soil in area not conducive to such an event, not identified in NYSEMO HMP	USGA Landslide Hazards Program
Extreme Heat	Yes	Yes	Identified by HMPC	Input from HMPC
Flood	Yes	Yes	Presidential Disaster Declarations, identified in NYSEMO HMP, identified by HMPC	NOAA, NCDC, FEMA Disaster Records, NYSEMO HMP
Hailstorm	Yes	Yes	See Severe Storm	See Severe Storm

Hazard of Concern	Potential for Hazard to occur in Study Area?	If Yes, does Hazard pose a Significant Threat	Reason for Determination	Source of Information
Hurricane	Yes	Yes	See Severe Strom	See Severe Storm
Land Subsidence	No	No	No local history	No local records of such an event
Landslide	No	No	No local history	No such records of such an event
Severe Storms (windstorm, hurricane, hailstorm, tornado)	Yes	Yes	Presidential Declarations, identified in NYSEMO HMP, identified by HMPC	Local records, NOAA, NCDC, FEMA Disaster Records, NYSEMO HMP
Severe Winter Storms (blizzard, ice storm)	Yes	Yes	Presidential Declarations, identified in NYSEMO HMP	NOAA, NCDC, Local records, input from HMPC
Tornado	Yes	Yes	See Severe Storm	See Severe Storm
Tsunami	No	No	No local records, not identified in NYSEMO HMP	No records of such an event in study area
Volcano	No	No	No volcanoes located in study area	NYSEMO HMP
Wildfires	No	No	Identified as minor hazard by HMPC	Input from HMPC
Windstorm	Yes	Yes	See Severe Storm	See Severe Strom

The City reported the results of their review of all potential hazards at the April 11, 2013 HMPC meeting and a draft list of potential hazards was developed. The HMPC was to review the draft final list of potential hazard, provide any comments or questions to the Committee Chairman with a final determination of potential hazards to be made at the next HMPC meeting. At the xx/xx/xxxx, a review was made of the draft potential hazards and was determined as final with no adjustments.

Hazard Ranking

Each hazard was ranked to indicate the probability of occurrence and their impacts on both population and property. This section outlines factors that influenced the ranking including probability of occurrence and impacts.

Probability of Occurrence

Probability of occurrence is an estimate of how often a hazard event occurs. The City reviewed historical records from Federal agencies such as FEMA, NOAA and USGS, the New York State (NYSEMO Hazard Mitigation Plan), New York City Department of Environmental Protection and local records on file in the City's Department of Public Works developed as a result of significant disaster related events. Designations utilized in this plan are consistent with those used in the New York State Hazard Mitigation Plan. Hazards were then ranked based on definition criteria, historical database information and the institutional memory of the HMPC.

Table 5-2 Probability of Occurrence Ranking Factors

Rating	Probability	Definition
1	Rare	Hazard event is likely to occur less than once every 30 years
2	Occasional	Hazard event is likely to occur less than once every 5 years, but more than once every 30 years
3	Frequent	Hazard event is likely to occur more than once every 5 years

Utilizing these criteria, the HMPC developed the following listing of hazards, in the order of potential frequency for occurrence and grouped based on similar damage characteristics:

- Flood
- Severe Storm (Windstorm, Hurricane, Coastal Storm, Hailstorm, Tornado)
- Severe Winter Storm (Ice Storm, Blizzard)
- Extreme Heat
- Drought
- Earthquake
- Dam Failure

5.2 Profiling Hazards

Requirement §201.6(c)(2)(i):
The risk assessment shall include a description of the location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

For each hazard, a generic description of the hazard and associated problems is provided along with details specific to the City of White Plains. Information on past occurrences and the extent or location of the hazard within or near the City and impacts, where known, are also discussed. To assess the history of natural hazard events in White Plains, the HMPC evaluated the hazards history for the City. Existing data and statistics are maintained in the Department of Public Works as well as FEMA and other Federal Agency databases.

The HMPC and other local resources, such as newspaper articles, were used to refine the data to more accurately indicate how hazards affected the City in the past. In general, information provided by planning team members is integrated into this section with information from other data sources.

FEMA Profiling Requirements

The FEMA requirements call for a full profiling of all natural hazards that impact the jurisdiction. Specifically, the Risk Assessment regulation (201.6. (c)(2)(i)) requires that "the plan include a description of all natural hazards that affect the jurisdiction".

There are FEMA requirements for plans to specifically address the following in their risk assessment: Location, Extent, Previous Occurrences, and Probability of Future Events. The FEMA "How to Guide: Understanding Your Risks" (FEMA 386-2) was consulted throughout the development of the risk assessment phase of the plan. In addition, the FEMA Region II "Tool Kit", which provided numerous tables and formats to assist in meeting requirements for plan approval was consulted. The FEMA requirements relating to the hazard profile/description section of a plan are provided in the following paragraphs as an indication of the actions taken.

The description of each hazard **shall** include the following information:

- The **location** or geographical areas in the community that would be affected.
- The hazard **extent** (i.e., magnitude or severity) of potential hazard events. For those hazards not geographically determined, plans **shall** indicate their applicable intensity. For example, in areas where tornadoes occur, plans *should* indicate the recorded intensities of previous events.
- The **probability**, likelihood, or frequency that the hazard event would occur in an area.

The plan **shall** also provide a discussion of **past occurrences** of hazard events in or near the community. This discussion *should* include:

- Information on the damage that occurred (e.g., costs of recovery, property damage, and lives lost) to the extent practicable.
- Level of severity (i.e., flood depth or extent, wind speeds, earthquake intensity, etc.)
- Duration of event.
- Date of occurrence.
- Sources of information used or consulted for assembling a history of past occurrences.

When appropriate, the hazard analysis *should* also identify on a map the areas affected by each identified hazard. Additionally, a composite map (i.e., a map showing combined information from different thematic map layers) *should* be provided for hazards with a recognizable geographic boundary (i.e., hazards that are known to occur in particular areas of the jurisdiction, such as floods, coastal storms, wildfires, and landslides).

The characterization of hazards *should* describe the conditions, such as topography, soil characteristics, meteorological conditions, etc., in the area that may exacerbate or mitigate the potential effects of hazards. The hazard analysis *should* be detailed enough to allow identification of the areas of the jurisdiction that are most severely affected by each hazard.

The plan *should* describe the analysis or sources used to determine the probability, likelihood, or frequency of occurrence as well as the severity or magnitude of future hazard events. The plan *should*

note any data limitations and create mitigation strategy actions for obtaining the limited data to improve future risk analysis efforts.

As mentioned above, planning jurisdictions are strongly encouraged to utilize the "How to Guides" and the Region II "Tool Kit" as they prepare their mitigation plan. In addition, the plan will have a greater likelihood of receiving FEMA approval if a specific effort is made to review the plan approval criteria in detail using the Local *Hazard Mitigation Plan Review Crosswalk* Form, and assuring that each element of the requirement is fully addressed in the plan.

5.3: Assessing Vulnerability

To understand risk, a community must evaluate what assets are exposed to hazard events. The inventory of assets considers the population, structures, and lifelines that could be impacted by hazard events. This section of the risk assessment will be broken down into the following subsections for each hazard:

- Overview of vulnerability
- Data and methodology used in the evaluation
- Impact on life, safety and health
- Identifying structures including general building stock, critical facilities and critical infrastructure
- Economic impact
- Addressing Repetitive Loss Properties (NFIP data for floods, other hazards as available)
- Estimating Potential Losses
- Analyzing Development Trends (new buildings, critical facilities and Infrastructure)
- Additional Data and Next Steps
- Overall vulnerability conclusion
- Multi-jurisdictional Risk Assessment

Information available locally as well as that available from the County of Westchester Planning Department and in the HAZUS MH database will be utilized to quantify the people, places, and things that could be injured, damaged, or destroyed during the occurrence of a hazard. Once the overall asset inventory was established, the portion of the inventory that is at risk of being impacted by the various hazards will be identified. This "at-risk" segment can be identified by overlaying the hazard area (for example, flood zone) with the asset data to estimate the assets at risk. For example, areas of residential development may be compared with flood zones to determine the locations and number of structures at risk of damage or destruction from flooding. Because HAZUS-MH was used to support this mitigation plan, HAZUS-MH provided data was used as a starting point for inventory data. HAZUS-MH includes a range of asset data based on national and regional data sets, such as the U.S. Census for population data. Potential sources of information including their own institutional memory were discussed with the HMPC at the April, 11, 2013 meeting. At this point the HMPC began the process of gathering the needed information. The HMPC then reviewed this data and selected data for inclusion, focusing on critical and essential facilities first. These facilities include police and fire stations, schools, hospitals, and other buildings that are critical to community functions and recovery after a hazard event. A range of other data also were reviewed; for example, local parcel data was reviewed for building value data but this data set did not provide all of the attributes needed for HAZUS-MH. Local building and facility data were used to supplement the HAZUS-MH provided data for individual, site-specific critical facility categories.

Hazard Profile – Flood

Description

A flood is a general and temporary condition of partial or complete inundation on normally dry land. The City of White Plains is susceptible to the following types of flooding:

- Riverine flooding, including overflow from a river channel, flash floods, and ice-jam floods.
- Riverine flooding including dam-break floods;
- Urbanized or street flood events
- Floodplain

According to USGS, floods are the most frequent and costly natural disaster in terms of human hardship and economic loss. As much as 90% of damage related to natural disasters (excluding drought) are caused by floods and associated mud and debris flows.

Floods do not follow a specific pattern from onset to termination of an event. They may develop over a period of days as a result of slow and steady rainfall, or can occur relatively quickly as a result of several inches of rainfall in an hour. Levels of soil saturation including water and frost, spring snow melt, intensity of rainfall, impediments and side friction in floodways can all impact the intensity and duration of a flood event.

Depending on where they occur, floods can pose significant risks to health and safety or interruption to transportation and other services. Loss of life, injury and the possibility of disease as a result of standing water are both critical and immediate concerns. Economic losses due to flooding may be significant. Collateral losses such as disruption of commerce, unemployment due to flooded workplaces, inundated transportation systems, disruption of utility systems and temporary loss of one's residence, expenses for disaster relief and cleanup, and other related costs, can add up to millions of dollars. Floods can increase the workload burden of municipal services several fold beyond typical daily operations especially for police, fire and public works operations. Health care services and professionals may become quickly overburdened during a local flood event with the potential for impacting health care and other resources outside the area. Annual economic losses due to flooding are estimated to be as high as $100 million in New York State.

During the Risk Assessment for flooding in the City of White Plains, the following agency websites were visited for pertinent information.

- The New York State Department of Environmental Conservation, Bureau of Flood Protection and Dam Safety, Division of Water, web site, http://www.dec.ny.gov/lands/31.html
- The Federal Emergency Management Agency (FEMA) National Flood Insurance Program staff and web site, http://www.fema.gov/business/nfip
- National Oceanic and Atmospheric Administration (NOAA), National Climate Data Center at http://www.ncdc.noaa.gov/oa/ncdc.html
- The United States Geological Survey (USGS) web site http://www.usgs.gov/natural_hazards/
- New York State Climate Office, Department of Earth and Atmospheric Sciences at Cornell University web site, http://nysc.eas.cornell.edu, http://www.eas.cornell.edu/cals/eas/acedemics/graduate/as-msphd.cfm

Riverine or Overbank Flooding

This type of flooding is defined as when a watercourse exceeds its "bank-full" capacity and is usually the most common type of flood event. Riverine flooding generally occurs as a result of prolonged rainfall, or rainfall that is combined with soils or drainage systems that are already saturated or overloaded from previous rain events. The duration of riverine floods may vary from hours to several days.

Factors that directly affect the amount of flood runoff include precipitation amount, intensity, and spatial and temporal distribution; the amount of soil moisture; seasonal variation in vegetation; snow depth; and the water resistance of the surface due to urbanization. Other factors, such as debris blocking a waterway or channel, can further aggravate a flood event. Development has altered the natural environment, changing and interrupting some of the natural drainage ways. As a result, drainage systems can become overloaded more frequently. The most serious overbank flooding occurs during flash floods that result from intense rainstorms and magnitude and short duration. In contrast to riverine flooding, this type of flood usually results from a heavy rainfall on a relatively small drainage area. Flash floods by definition occur very quickly and may occur with little or no warning.

Urban or Street Flood Events

These events occur due to the conversion of open space to buildings, roads and parking lots, which cause the land to lose its ability to absorb rainfall. Urbanization increases runoff two to six times over what would occur on natural terrain. Except at underpasses, street flooding and yard ponding usually do not exceed more than a foot or two and are often viewed more as a nuisance than a major hazard. However, during periods of urban flooding, high velocity flows can occur in streets, even in areas with only shallow flooding.

Floodplains

The area adjacent to a channel is the floodplain. Floodplains are illustrated on inundation maps, which show areas of potential flooding and water depths. In its common usage, the floodplain most often refers to that area that is inundated by the 100-year flood, the flood that has a 1-percent change in any given year of being equaled or exceeded. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program.

The potential for flooding can change and increase as a result of land use changes and changes to land surface that change the floodplain. A change in environment can create localized flooding problems in and out of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

Geographic Location and Extent

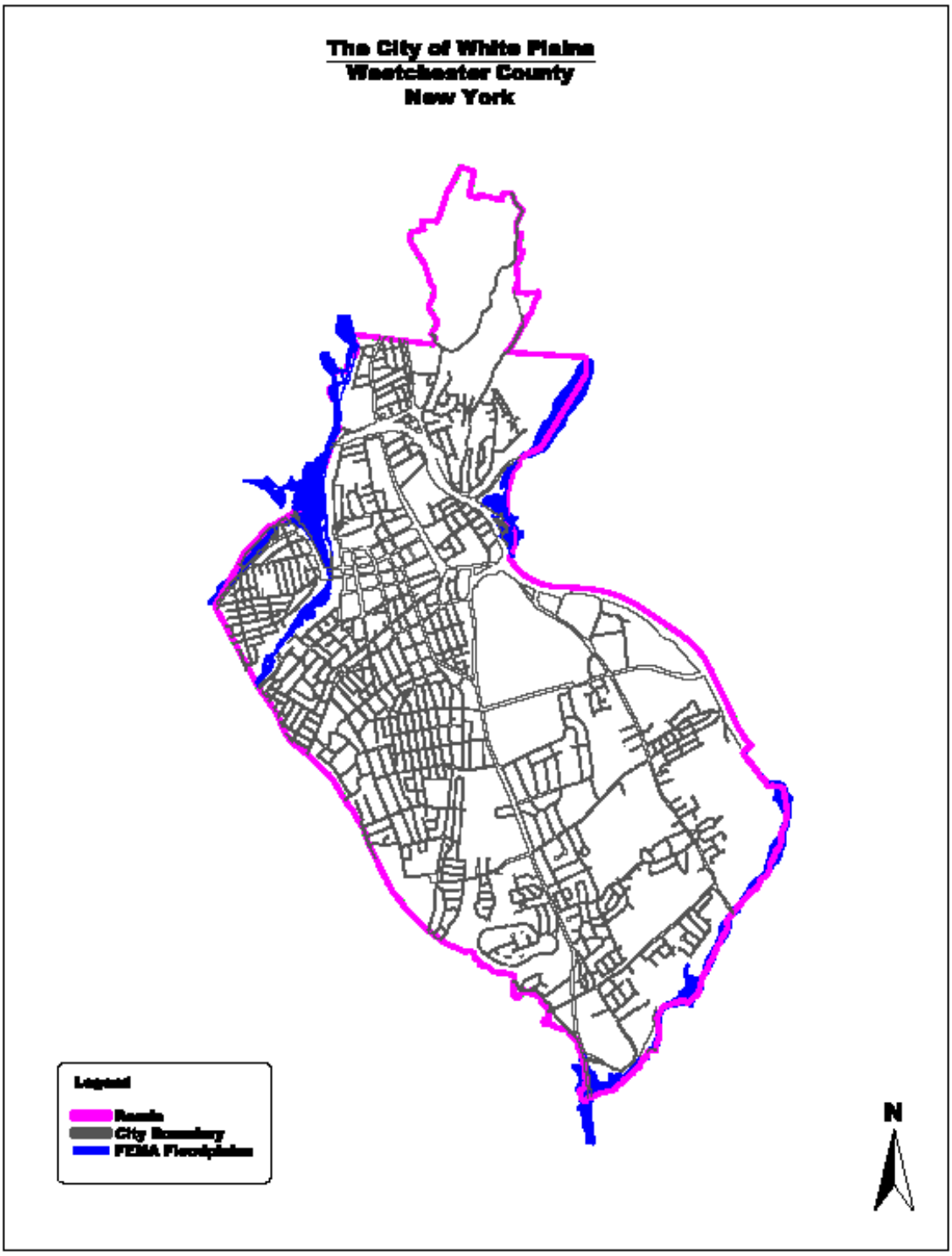
Several areas of the City of White Plains lie within 100 and 500 year floodplains. Additionally, areas outside these designated floodplains experience what is known as "urban flooding" resulting from undersized or poorly maintained drainage systems combined with intense rainfalls of short or long duration.

This study utilized FEMA Flood Insurance Rate Maps (FIRMS) dated September 2007 in order to determine sections of the study area located in the 100 and 500 year floodplains. An interview was conducted with the Commissioner of Public Works to determine those areas most susceptible to flooding including areas where flood damage had occurred in the past. The following FEMA FIRMS contain areas in the 100 and 500 year floodplains:

- 36119C0269F
- 36119C0288F
- 36119C0267F
- 36119C0351F
- 36119C0259F
- 36119C0332F
- 36119C0266F
- 36119C0286F
- 36119C0268F

A complete set of Floodplain Maps is available at the City of White Plains Department of Public Works.

Figure 5-1 September 2007 FEMA FIRM of Flood Prone Areas of The City of White Plains 100(1%) and 500 (0.2%)



Source: FEMA FIRM for The City of White Plains, September 2007

Major Sources of Flooding

The City of White Plains has multiple creeks, tributaries, and associated watersheds. The City is highly urbanized as a result of the "built-out" condition of the study area. As such, the natural hazards related to stormwater and flood management are particularly complicated by the fact that space is at a premium and thus many structures are within the floodplain. All drainage ways are subject to periodic flooding. The figure below shows the major water bodies and drainage ways in the study area. Waterways which have the ability to cause flooding include:

- Mamaroneck River – East Branch
- Mamaroneck River – West Branch
- Mamaroneck River – Upper Reach
- Mamaroneck River – Lower Reach
- Bronx River
- Silver Lake
- Bloomingdale Pond
- Lakenridge
- White Plains Reservoir 1
- White Plains Reservoir 2

Previous Occurrences and Losses

According to the NOAA Satellite and Information Service, National Climatic Data Center, 69 Flood Events of varying degrees have occurred in Westchester County from January 1950 through May of 2008. These events have included Urban, Flash and Coastal Flooding. Table 5-1 provides a listing of Presidential Disaster Declarations for flood events impacting the City of White Plains from 1996 through 2007.

Table 5-3 Presidential Disaster Declarations for Flooding Events 1996-2007

Type of Event	Date	Declaration Number	Aid to Municipality (In Dollars)
Severe Storm Flooding	October 1996	1146-DR-NY	
Hurricane Floyd	September 1999	1296-DR-NY	
Severe Storm Flooding	April 2005	1589-DR-NY	
Severe Storm, Inland and Coastal Flooding	April 2007	1692-DR-NY	
Tropical Storm Irene	August 2011		

Source: FEMA website. Some overlap with Severe Storm Hazard

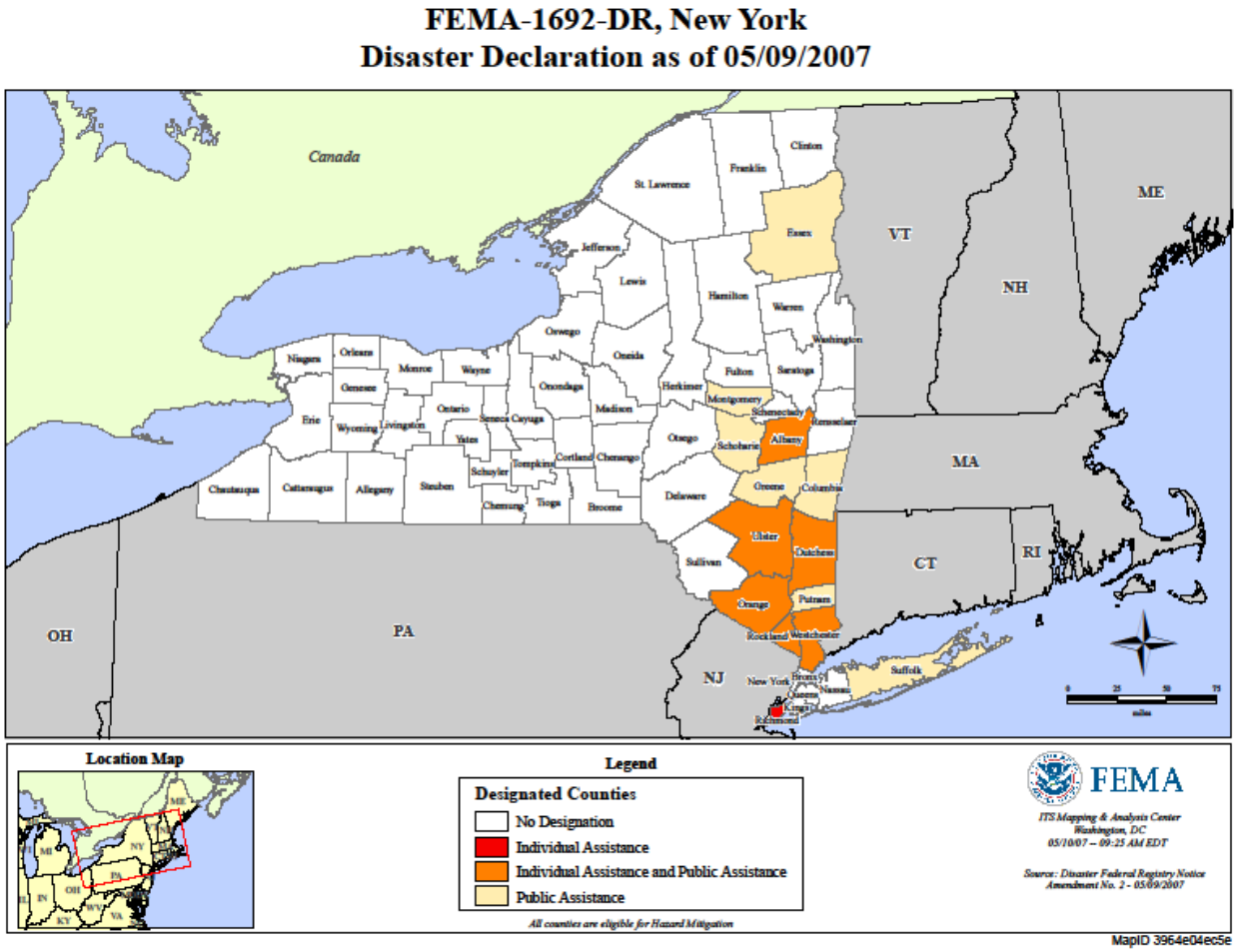
As part of the City of White Plains Flood Mitigation program, the Department of Public Works has identified five (5) individual locations where localized flooding has previously occurred. Table 5-4 lists the area of the study area where the localized flooding has occurred, the street location as well as the reason the flooding is occurring.

Table 5-4 Localized Flooding Locations Identified by Department of Public Works

Location	Description
Bronx River Parkway	
Belway Place	
Haarlem Avenue	
Cloverdale Avenue	
Longview Avenue	

Source: The City of White Plains Department of Public Works

Figure 5-2 FEMA Disaster Declaration for Flooding – DR 1692 (April 2007)



Source: http://www.gismaps.fema.gov/2007graphics/dr1692/dec_1692.pdf

Probability of Future Events

The FEMA FIRM maps when overlaid on municipal tax maps indicates a number of built out areas in the City of White Plains susceptible to flooding and for which historical records have verified numerous flooding events. Much of the Stormwater and Floodplain infrastructure in these areas is in excess of 75 years old and was designed when areas of open space still existed in the municipality. Many of those open space areas have been built up with roads, homes, businesses and corporate parks, depleting previous areas where water had previously been absorbed into aquifers.

Changing storm patterns over the last few years have created rain events of greater intensity and duration which can lead to surcharging of stormwater drainage conveyance systems allowing water to spread out over flat low lying areas flooding streets and basements. Based on historical records the probability of occurrence or flood events would be considered frequent (likely to occur more than once every five years).

Vulnerability Assessment

A vulnerability assessment is defined as assessing the vulnerability of people and the built environment to a given level of hazard. After identifying types of risk, a vulnerability analysis can help to determine the weak points in the community. This assessment examines the vulnerability of the existing and future built environment, such as structures, utilities, roads and bridges, as well as environmental vulnerability, such as open space that can suffer from erosion. Once the geographic areas of risk are identified in the City of White Plains, vulnerability can be assessed for the population, property and resources at risk in those areas. Vulnerability indicates what is likely to be damaged by the identified hazards and how severe the damage may be. For example, if an area is determined to be at risk of flooding, vulnerability estimates for that area could include residential property losses, impacts to the tax base and damages to public infrastructure. Flooding events can impact several areas of the City of White Plains. All assets including population, structures, critical facilities and utilities are vulnerable. The following sections evaluate and estimate the potential impact of flooding:

- Overview of vulnerability
- Data and methodology used in the evaluation
- Impact on life, safety and health
- Identifying structures including general building stock, critical facilities and critical infrastructure
- Economic impact
- Addressing Repetitive Loss Properties (NFIP data for floods, other hazards as available)
- Estimating Potential Losses
- Analyzing Development Trends (new buildings, critical facilities, and infrastructure)
- Additional Data and Next Steps
- Overall vulnerability conclusion
- Multi-jurisdictional Risk Assessment

Overview of Vulnerability

Municipal staff input gathered from the Natural Disaster Survey and information gathered by the HMPC identifies flooding as the most significant concern to the City of White Plains. A number of built out, densely populated areas of the municipality lie within or in close proximity to floodplains and have experienced a number of flooding events in the past. To assess vulnerability, potential losses were calculated for 100 year and 500 year flood events.

Data and Methodology

Data used to analyze the flood hazard was gathered from historical records, the September 2007 Floodplain maps for the municipality (Hard Copy and HAZUS-MH), Westchester County, New York Geographic Information Systems Maps and Overlays, input from the HMPC, the Natural Hazards Survey and information on file. Population data, Residential and Commercial Building Stock and associated Values (Structure and Content) and FEMA Floodplain data was taken from HAZUS-MH. Critical facilities, infrastructure and lifeline information was gathered locally and by utilizing HAZUS-MH. ***In analyzing the Flood Hazard, HAZUS-MH calculated loss information for 100 year and 500 year events (consistent with FEMA Floodplain Mapping).***

Figure 5-3: USGS Digital Elevation Model and FEMA 100 year and 500 year Floodplains for the City of White Plains
Source: HAZUS-MH

Figure 5-4: Floodplain Depth Grid for a 100 Year Mean Return Period Flood Event
Source: HAZUS-MH

Figure 5-5: Floodplain Depth Grid for a 500 Year Mean Return Period Flood Event
Source: HAZUS-MH

Impact on Life, Safety and Health

HAZUS-MH was utilized to determine the population at risk in the 100 and 500 year flood events. Table 5.5 below shows the population placed in jeopardy as a result of flood hazard events.

Table 5-5 Sheltering Requirements

Category	100 Year Event	500 Year Event
Number of People Displaced	1,969	2,050
Households Displaced	656	683
Persons Seeking Temporary Shelter	1,709	1,800

Source: HAZUS-MH

The table above is utilized as part of the municipality's emergency response plan when considering relocation and sheltering needs. Because of numerous past flooding events, those living and working in the floodplain areas are generally aware under what conditions they may experience flooding thus keeping to a minimum injuries and deaths. The emergency response plan for such areas includes closing off of flooded streets which limits the exposure to injury or death to pedestrians and motorists. Increasing public awareness as to the dangers associated with flooding, which is part of this plan's mitigation strategy, will aid in reducing future injuries or deaths.

The following figures and tables show comparisons between the 100 year and 500 year floodplain areas in relation to population densities for the elderly and low income families.

Figure 5-6: Distribution of Population Density Relative to 100 and 500 Year Floodplains
Source: HAZUS-MH

Figure 5-7: Distribution of Elderly Poulation (65 and older) Density Relative to 100 and 500 Year Floodplains
Source: HAZUS-MH

Figure 5-8: Distribution of Low Income Population Density Relative to 100 and 500 Year Floodplains
Source: HAZUS-MH

Identifying structures including general building stock, critical facilities and critical infrastructure

General Building Stock, Critical Facilities and Critical Infrastructure were evaluated relative to their locations within 100 and 500 year floodplains. The potential loss value was determined using HAZUS-MH. The following tables were created using HAZUS-MH.

Table 5-6 Buildings Exposed to the 100 year and 500 year Flood Hazard Event by Occupancy Class and Total Replacement Value ($1,000)

Building Occupancy Class	Number of Buildings in Study Area	Exposure Value in Study Area	Percent of Total For Study Area	Exposure Value for 100 Year Event	Percent Total for 100 Year Event	Exposure Value for 500 Year Event	Percent Total for 500 Year Event
Agriculture	95	16,034	0.3%	5,851	0.3%	6,567	0.4%
Commercial	1,415	1,919,291	30.5%	736,062	41.7%	711,760	41.8%
Education	59	73,101	1.2%	46,402	2.6%	41,468	2.4%
Government	80	92,462	1.5%	26,522	1.5%	26,337	1.5%
Industrial	360	276,289	4.4%	84,162	4.8%	84,546	5.0%
Residential	10,086	3,809,353	60.5%	836,727	47.4%	31,090	1.8%
Religion	114	107,387	1.7%	30,833	1.7%	21,467	1.3%
Total	**12,209**	**6,293,917**	**100%**	**1,766,559**	**100%**	**1,704,775**	**100%**

Source: HAZUS-MH

Table 5-7 Building Stock by Construction Type as a Percentage of Study Area Total

Building Construction	Count	Percent of Total
Wood	8498	69.6
Steel	995	8.2
Concrete	297	2.4
Precast	69	0.6
Reinforced Masonry	343	2.8
Un-reinforced Masonry	2000	16.4
Manufactured Homes	6	0.0
Total	**12,209**	**100%**

Source: HAZUS-MH

Table 5-8 Essential Facilities

Category	Number of Facilities in Study Area
Hospitals	3
Medical Clinics	
Schools	23
Fire Stations	7
Police Stations	1
Emergency Operations	1
Public Works Operations and Maintenance	2

Source: HAZUS-MH / Local Information

Transportation and Utility Lifeline Facilities are those infrastructures both public and privately owned that provide services which allow communities to function and be economically viable. The HASUZ-MH program maintains a local inventory of these facilities including transportation system which include highways, railways, light rail, bus, ports, ferry and airports. Also included in the inventory are utility systems such as potable water, wastewater, natural gas, crude and refined oil, electric power and communications. The total value of the lifeline inventory exceeds $869 million and includes 56 kilometers of highways, 32 bridges, and 459 kilometers of pipes.

Table 5-9 Transportation System Lifeline Inventory

System	Component	No. of locations / segments	Replacement Value (millions of dollars)
Highway	Bridges	32	462.70
	Segments	82	395.80
	Tunnels	0	0.00
		Subtotal	*858.50*
Railways	Bridges	3	0.30
	Facilities	0	0.00
	Segments	4	8.00
	Tunnels	0	0.00
		Subtotal	*8.30*
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	*0.00*
Bus	Facilities	2	2.60
		Subtotal	*2.60*
Ferry	Facilities	0	0.00
		Subtotal	*0.00*
Port	Facilities	0	0.00
		Subtotal	*0.00*
Airport	Facilities	0	0.00
	Runways	0	0.00
		Subtotal	*0.00*
		Total	**869.40**

Source: HAZUS-MH

While the facilities shown in Table 5-7 exist in the study area, only a portion of the highway network is the operating and maintenance responsibility of the City of White Plains. Highway mileage in the study area is broken down as shown in the Table 5-8.

Table 5-10 Municipal Entity Responsible for Highway Transportation System

Municipal Entity Responsibly	Mileage
City of White Plains	112.0
New York State Department of Transportation	2.1
New York State Thruway Authority	3.7
County of Westchester	24.7

Source: New York State Department of Transportation Highway Inventory

The railway system is operated and maintained by the Metro-North Commuter Railroad and the Airport is operated and maintained by the County of Westchester.

Table 5-11 Utility System Lifeline Inventory

System	Component	No. of locations/segments	Replacement Value (millions of dollars)
Potable Water	Distribution Lines	NA	4.6
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	*4.60*
Waste Water	Distribution Lines	NA	2.80
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	*2.80*
Natural Gas	Distribution Lines	NA	1.80
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	*1.80*
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	*0.00*
Electric Power	Facilities	0	0.00
		Subtotal	*0.00*
Communication	Facilities	0	0.00
		Subtotal	*0.00*
		Total	**9.20**

Source: HAZUS-MH

In order to fully evaluate the potential for damage and loss based on occupancy class, severity of damage to each type of occupancy must also be considered. Table 5-10 provides definitions for damage categories to a light wood framed building.

Table 5-12 Example of Structural Damage by Category and Description for Light Wood Framed Buildings

Damage Category	Description
None	
Slight	Small plaster or gypsum board cracks at corners of door and window openings and wall/ceiling intersections; Small cracks in masonry chimneys and masonry veneer.
Moderate	Large plaster or gypsum board cracks at corners of doors and window openings; small diagonal cracks across Shear wall panels exhibited by small cracks in stucco and gypsum wall panels; large cracks in brick chimneys; toppling of tall masonry chimneys
Extensive	Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations; partial collapse of room-over-garage or other soft-story configurations.
Complete	Structure may have large permanent lateral displacement, may collapse, or be in imminent danger of collapse due to cripple wall failure of the lateral load resisting system; some structures may slip and fall off the foundations; large foundation cracks.

Source: HAZUS-MH, 2005

Economic Impact

HAZUS-MH was utilized to estimate economic losses for buildings, critical facilities and transportation and lifeline systems. Building related losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during a flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood. The total loss estimated for the 100 year floods is 58.68 million dollars and 64.65 million dollars for the 500 year flood which represents 3.32% and 3.79% respectively of the total replacement value of the scenario buildings.

Table 5-13 Building-Related Economic Loss Estimates 100 Year Event (Millions of Dollars)

Category	Area	Residential	Commercial	Industrial	Other	Total
Building Loss	Building	9.29	8.71	0.85	0.95	19.80
	Content	5.61	24.49	1.85	5.59	37.54
	Inventory	0.00	0.36	0.20	0.02	0.58
	Subtotal	*14.90*	*33.56*	*2.90*	*6.56*	*57.91*
Business Interruption	Income	0.01	0.16	0.00	0.01	0.17
	Relocation	0.01	0.04	0.00	0.01	0.06
	Rental Income	0.02	0.02	0.00	0.00	0.05
	Wage	0.01	0.16	0.00	0.34	0.51
	Subtotal	*0.05*	*0.38*	*0.00*	*0.35*	*0.77*
All	**Total**	**14.95**	**33.93**	**2.90**	**6.91**	**58.68**

Source: HAZUS-MH

Table 5-14 Building-Related Economic Loss Estimates 500 Year Event (Millions of Dollars)

Category	Area	Residential	Commercial	Industrial	Other	Total
Building Loss	Building	11.11	8.96	1.18	1.08	22.33
	Content	7.09	24.99	2.49	6.26	40.83
	Inventory	0.00	0.39	0.32	0.03	0.73
	Subtotal	*18.20*	*34.33*	*3.99*	*7.37*	*63.89*
Business Interruption	Income	0.01	0.16	0.00	0.01	0.17
	Relocation	0.01	0.04	0.00	0.01	0.06
	Rental Income	0.02	0.02	0.00	0.00	0.05
	Wage	0.01	0.15	0.00	0.33	0.49
	Subtotal	*0.05*	*0.37*	*0.00*	*0.34*	*0.76*
All	**Total**	**18.25**	**34.70**	**3.99**	**7.71**	**64.65**

Source: HAZUS-MH

For Transportation and Utility Lifeline System Losses, HAZUS-MH computes the direct repair cost for each component only. There are no losses computed by HAZUS-MH for business interruption due to lifeline outages. Long term economic impacts are estimated for 15 years after the earthquake. This information is quantified in terms of income and employment changes within the study area. For the 100 year and 500 year Flood Events, there was no direct economic loss for transportation or lifeline systems.

The direct Economic Losses for Vehicles by time and time of day was calculated by HAZUS-MH. Table 5-13 reflects the values calculated.

Table 5-15 Direct Economic Losses for Vehicles (in dollars)

Category	Cars	Light Trucks	Heavy Trucks	Total
Study Area Day	38,618	28,365	2,080	69,063
Study Area Night	26,579	19,481	2,197	48,257
100 Year Event Day				
100 Year Event Night				
500 Year Event Day				
500 Year Event Night				

Source: HAZUS-MH

HAZUS-MH, for the 100 year and 500 year flood event scenarios, did not indicate any Economic Income and Employment Impact with or without outside.

Addressing Repetitive Loss Properties (NFIP data for floods)

The Federal Emergency Management Agency National Flood Insurance Program provides flood loss data as a result of insurance claims filed by home/business owners who have purchased a separate insurance policy with respect to flood damage. Loss information based on claims files is shown in the following table:

Table 5-16 FEMA NFIP Loss Cases and Payments to the City of White Plains - 1978 to June 30, 2011 (Repetitive and Non-Repetitive)

Total Losses	Closed Losses	Open Losses	Closed without Payment	Total Payments
155	110	1	44	$588,562.23

Source: FEMA NFIP BureauNet (http://bsa.nfipstat.com/reports/1040htm#36)

The City of White Plains requested and received from the New York State Department of Environmental Conservation Floodplain Management Section, repetitive flood loss information for buildings from the period 1978 through December 2008. Buildings defined as repetitive loss are those sustaining four or more paid losses of more than $1,000 each, or two losses within a 10-year period that, in the aggregate, equal or exceed the current value of the insured property, or three or more losses that, in the aggregate, equal or exceed the current value of the insured property. For the study area, a total of __ properties were identified as having incurred repetitive losses. Property types incurring repetitive losses include __ single family units, __ multi-family (2-4) units, __ condominium units and __ non-residential properties. Tables 5-17 and 5-18 list the number of repeat losses and losses in defined flood zones.

Table 5-17 Properties sustaining multiple repetitive losses

Number of Repetitive Losses	Number of Properties Sustaining Losses
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	

Source: NYSDEC Floodplain Management Section

Table 5-18 Properties sustaining losses by flood zone type

Flood Zone Designation	Number of Repetitive Loss Properties in the Flood Zone	Flood Zone Description (See glossary for detailed descriptions)
A		An area inundated by 100 year flooding for which no Base Flood Elevations (BFEs) have been established.
AE		An area inundated by 100 year flooding for which BFEs have been determined.
AH		An area inundated by 100 year flooding (usually ponding) for which BFEs have been determined, flood depths may range from 1-3 feet.
B		An area inundated by 100 year and 500 year flooding
C		An area determined to be outside the 100 year floodplain
A02		An area inundated by 100 year flooding for which no BFEs have been established

A07		An area inundated by 100 year flooding for which no BFEs have been established
X		An area determined to be outside the 100 year floodplain

Source: NYSDEC Floodplain Management Section

Taking the Repetitive Flood Loss Data provided and overlaying the loss locations on the study area's FIRM maps, it is estimated that 90% of the Repetitive loss buildings are located in, or are in close proximity to the 100 and 500 year floodplains. Figure 5.9A shows the 100 and 500 year floodplain areas overlaid with the location of __ of the ___ Repetitive Loss Locations.

In order to estimate the vulnerability in terms of estimated potential dollar losses, actual loss information was taken from the data provided, analyzed and categorized for all the Repetitive Loss Buildings. Based on the data provided, there were ___ reported losses for the ___ identified properties. The total dollar value of these losses was $_____ and the average payout per loss was $_____. The largest single payout averaged $_____ on a non-residential structure with __ reported claims. The largest single payout on a resident structure averaged $_____ with __ reported claims.

Figure 5-9: 100 and 500 Year Floodplain Areas Overlaid with Repetitive Loss locations
Source: HAZUS-MH

Narrative of Flood Area

The area in which the majority of repetitive losses take place (99% of all loss properties) is locally identified as the _____ area of White Plains. The area which has sustained the greatest number of impacted properties is bounded by the _____ Road on the _____ and _____, and the Harlem Division of the Metro North Commuter Railroad on the _____.

The natural features which make up the area where majority of losses take place includes the relative consistency in elevation over a large area. Combined with both an aged and outdated stormwater conveyance system, the majority of the area lies in the 100 and 500 year floodplain, or may be influenced by the 100 and 500 year floodplain depending on storm intensity and duration. Land use is primarily residential with single and two family homes on small parcels of 5,000 to 10,000 square feet. Two schools with associated playing fields and a pond are located on the ____ side of the area. The area is generally considered to be built out with minimal vacant land present.

There are ___ streams which impact the flood loss area. Flowing from the ____ are _____ Creek, _____ Brook, and _____ Brook. These watercourse features are shown on the City of White Plains Flood Insurance Rate Maps (FIRMS).

National Flood Insurance Program – Community Rating System

The City of White Plains is not a participant in the National Flood Insurance Program Community Rating System (CRS) meaning that the community is classified as a 10 and that flood insurance purchased does not receive a discount for efforts by the City of White Plains to mitigate flooding.
As part of the City's mitigation efforts, registration with and participation in the National Flood Insurance Program – Community Rating System will be implemented. Details of this effort are included in the Mitigation Strategies section.

Estimating Potential Losses

Vulnerability in terms of dollar losses provides the study area and the State with a common framework in which to measure the effects of hazards on vulnerable structures.

HAZUS-MH was utilized to develop estimated losses based on 100 year and 500 year floodplain events. The analysis in Tables 5-15 to 5-19 reflects loss data for 100 and 500 year flood events.

For the 100 year floodplain event, it is estimated that 12 buildings will be at least moderately damage with 2 completely destroyed. (Definitions with respect to "damage states" are documented in Volume 1, Chapter 5 of the HAZUS Flood Technical Manual).

Table 5-19 Expected Building Damage by Occupancy and Range of Damage Percent (%) (100 year event)

Occupancy	Count / 1-10%	Count / 11-20%	Count / 21-30%	Count / 31-40%	Count / 41-50%	Count / Substantially
Agriculture	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Commercial	0 / 0.00	1 / 100.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Education	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Government	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Industrial	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Religion	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Residential	0 / 0.00	0 / 0.00	0 / 0.00	5 / 45.45	4 / 36.36	2 / 18.18
Total Count	**0**	**1**	**0**	**5**	**4**	**2**

Source: HAZUS-MH

Table 5-20 Expected Building Damage by Building Type and Range of Damage Percent (%) (100 year event)

Building Type	Count / 1-10%	Count / 11-20%	Count / 21-30%	Count / 31-40%	Count / 41-50%	Count / Substantially
Concrete	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Manuf. Housing	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Masonry	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Steel	0 / 0.00	0 / 0.00	0 / 0.00	5 / 45.45	4 / 36.36	2 / 18.18
Wood	0	0	0	5	4	2

Source: HAZUS-MH

For the 500 year floodplain event it is estimated that 20 buildings will be at least moderately damaged with 5 completely destroyed. (Definitions with respect to "damage states" are documented in Volume 1, Chapter 5 of the HAZUS Flood Technical Manual).

Table 5-21 Expected Building Damage by Occupancy and Range of Damage Percent (%) (500 year event)

Occupancy	Count / 1-10%	Count / 11-20%	Count / 21-30%	Count / 31-40%	Count / 41-50%	Count / Substantially
Agriculture	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Commercial	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Education	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Government	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Industrial	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Religion	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Residential	0 / 0.00	1 / 5.00	1 / 5.00	8 / 40.00	5 / 25.00	5 / 25.00

Total Count	**0**	**1**	**1**	**8**	**5**	**5**

Source: HAZUS-MH

Table 5-22 Expected Building Damage by Building Type and Range of Damage Percent (%) (500 year event)

Building Type	Count / 1-10%	Count / 11-20%	Count / 21-30%	Count / 31-40%	Count / 41-50%	Count / Substantially
Concrete	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Manuf. Housing	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Masonry	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Steel	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00
Wood	0 / 0.00	1 / 5.00	1 / 5.00	8 / 40.00	5 / 25.00	5 / 25.00

Source: HAZUS-MH

Table 5-23 School Damage and Functionality ($1,000)

Event Scenario	Count of Schools	Total Building Damage ($)	Total Content Damage ($)	Non-Functional Schools	Average Restoration Time
100 Year	1	41.77	225.56	1	480
500 Year	1	31.28	168.89	1	480

Source: HAZUS-MH

For Transportation and Utility Lifeline System Losses, HAZUS-MH computes that none of these facilities would be flooded / sustain flood damage. Based on past experience, these types of analysis are better left to local officials since some form of damage, particularly to highways and stormwater culverts has occurred in the past as a result of flood events. The need for further analysis will be addressed in the Mitigation Strategy Section of this Plan.

Figure 5-10: Density of Losses for Residential Buildings (Structure and Content) for the 100 Year Flood Event
Source: HAZUS-MH

Figure 5-11: Density of Losses for Residential Buildings (Structure and Content) for the 500 Year Flood Event
Source: HAZUS-MH

Figure 5-12: Density of Losses for Commercial Buildings (Structure and Content) for the 100 Year Flood Event
Source: HAZUS-MH

Figure 5-13: Density of Losses for Commercial Buildings (Structure and Content) for the 500 Year Flood Event
Source: HAZUS-MH

Figure 5-14: Critical Facilities in Relation to the 100 and 500 Year Floodplains
Source: Locat information; HAZUS-MH; WCGIS

In April 2007, the City of White Plains sustained severe flooding which resulted in a Federal Disaster Declaration (DR-1692-NY) which provided both individual and public assistance. Widespread areas of the City of White Plains sustained flooding including the following areas/streets: LIST AREAS HERE

Loss data NFIP properties for this flood event is provided elsewhere in this plan. The City of White Plains submitted assistance applications to FEMA in the amount of $_____ for which included damage to infrastructure, equipment and debris management.

In addition to general building stock at risk from floods, critical facilities and infrastructure susceptible to floods were also evaluated. Critical facilities include police, fire, EMS, public works, schools, hospitals, senior facilities and transportation / transmission systems. Figure 5-14 depicts where these type facilities are located in the City of White Plains.

According to the analysis, the following critical facilities are in or are in close proximity to the 100 and 500 year floodplains and thus may be susceptible to damage or destruction during a flood hazard event: LIST AREAS HERE

As a result of floods, debris is generated as a result of damage to buildings and infrastructure as well as natural features such as trees and rock formations. HAZUS-MH estimates the amount of debris which can be generated by a particular earthquake event. The model breaks the debris into three general categories; finishes, structures and foundations. This distinction is made due to the different types of material handling equipment required to handle the debris. Table 5-24 shows the amount of debris generated by event scenario.

Table 5-24 Debris Generated (Tons)

Category	100 Year Event	500 Year Event
Finishes	1168	1356
Structures	254	288
Foundations	172	204

Source: HAZUS-MH

Analyzing Development Trends (new buildings, critical facilities and infrastructure)

Section 4 of this plan Municipal Profile – Future Development identifies several areas in the City of White Plains where the potential for development or redevelopment exists. Recent changes to the New York State Building Code have increased first floor elevations in residential units from 1 foot to 2 feet above the base flood elevation and include other provisions related to flooding. Any structures which are proposed need to take into account their impact on the surrounding areas due to any increases in impervious surfaces as well as the ability of the existing stormwater conveyance system to accommodate increased flows. Where newly developed or redeveloped sites are proposed the concept of zero (0) runoff should be given due consideration.

Additional Data and Next Steps

The City of White Plains will continue to monitor and record the impacts of flood hazard events as they occur, better educate the public about flooding and encourage the use of the NFIP Flood Insurance Program. Monitoring and recording the impacts of flood events will allow for both short term and long range planning for improving stormwater conveyance infrastructure where possible which will in term lessen the impacts of flood hazard events.

Overall Vulnerability Conclusion

The flood hazard has been determined to be a significant event and has been ranked as a high risk for the City of White Plains.

Hazard Profile – Severe Storm (Windstorm, Hurricane, Hailstorm, Tornado)

Description

The severe storm hazard includes Coastal Storms, Hailstorms, Hurricanes, Tornados and Windstorms, each of which is defined in the table below.

Table 5-25 Severe Storm Hazard Definitions

Severe Storm Hazard Definitions

Hazard Type	Definition
Natural Hazards	
Coastal Storm	Any type of storm which develops over the ocean and ultimately impacts land areas.
Hailstorm	Showery precipitation in the form of irregular pellets or balls of ice more than 5 mm in diameter, falling from a cumulonimbus cloud.
Hurricane	Tropical cyclones, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74 miles per hour or more and blow in a large spiral around a relatively calm center or "eye". Circulation is counterclockwise in the Northern Hemisphere.
Tornado	A local atmospheric storm, generally of short duration, formed by winds rotating at very high speeds, usually in a counterclockwise direction. The vortex, up to several hundred yards wide, is visible to the observer as a whirlpool-like column of winds rotating about a hollow cavity or funnel. Winds have been estimated to be in excess of 300 miles per hour.
Windstorm	Wind is air moving from high to low pressure. Windstorm events are associated with cyclonic storms, thunderstorms and tornados.

Source: New York State Hazard Mitigation Plan

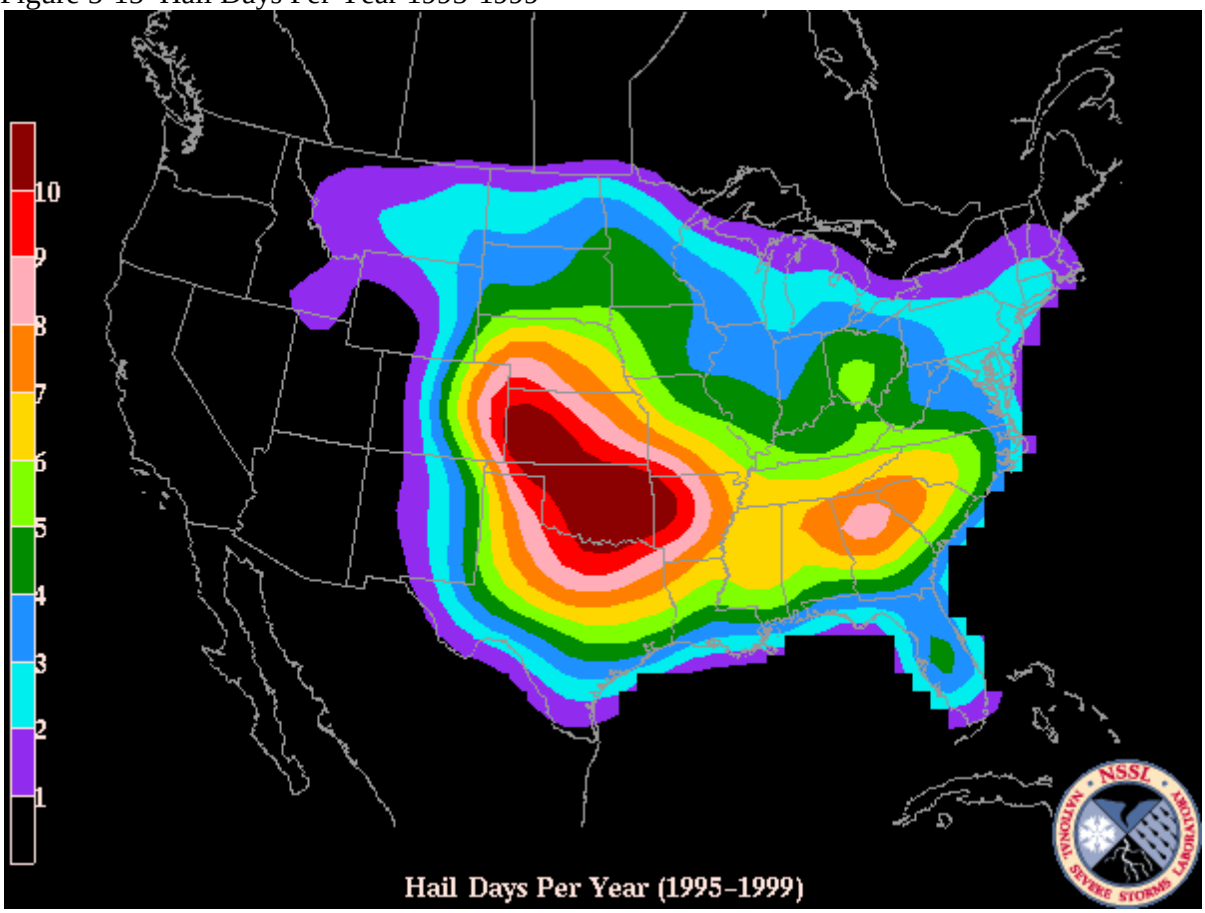
Location and Extent

Severe storms may impact the entire study area and have the ability to cause widespread damage. Although a minimum amount of locally documented information is available, certain areas as well as the City as a whole have been impacted by severe storm events in the past.

Hailstorms

The figure below (Figure 5-15) indicates that the study area receives 2-3 days of hail annually. There are no records available locally which indicate any amount or the severity of damage from these type events. Hail is most common in areas of the Midwest where such storms can cause significant damage to crops. Locally, hail bas been known to break the occasional window or dent a vehicle's body.

Figure 5-15 Hail Days Per Year 1995-1999

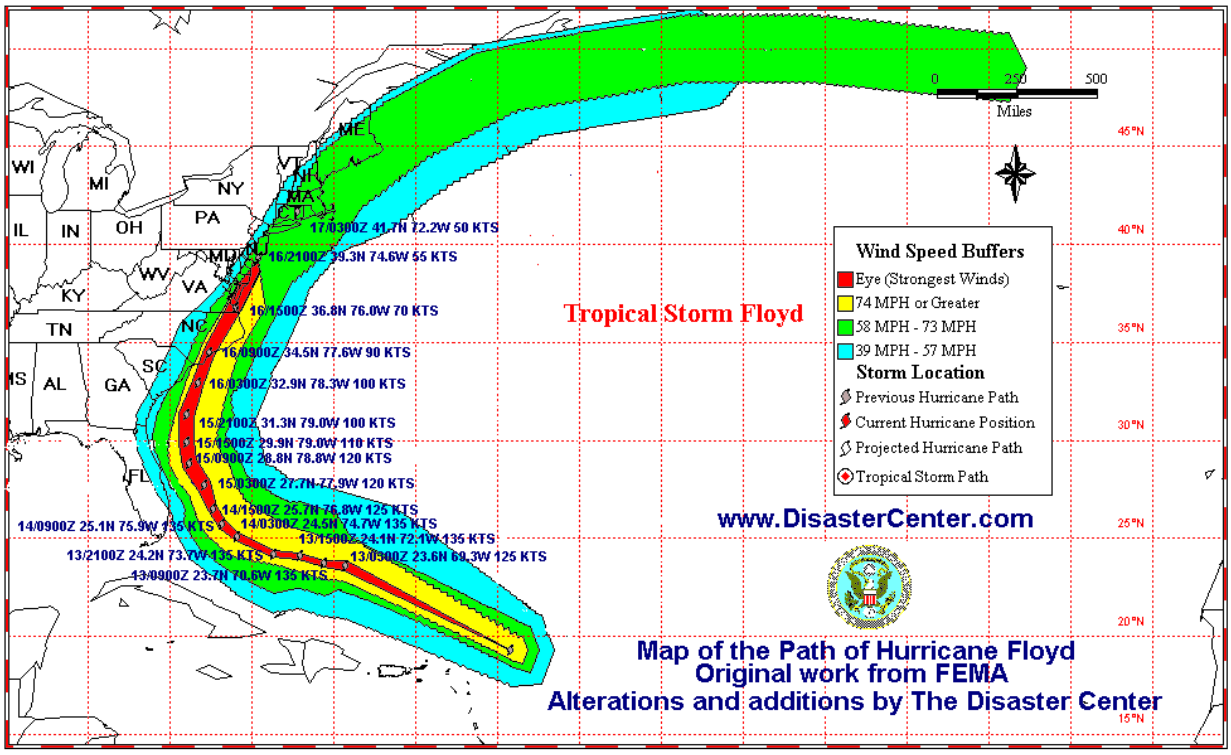


(The mean number of days per year with one or more events within 25 miles of a point is shown here. The fill interval is 1, with the purple starting at 1. For the significant (violent), its 5 days per century (millennium), Source: NSSL)
Source: NYS Hazard Mitigation Plan 2008

Hurricanes

A number of hurricanes form annually in the Atlantic Ocean typically starting in early June and ending in late November of each year. These hurricanes make their way west and for the most part impact the southern United States extending as far west as Texas. From time to time, hurricanes will turn north and impact the east coast of the United States from Florida to Maine. The last major hurricane to strike the study area was Sandy in 2012.

Figure 5-16 Hurricane Floyd Tracking Map



Source: Disaster Center (http://disastercenter.com/FloydTre.html)

The magnitude or severity of a severe storm consists of several factors including duration and sustained wind speed. Hurricanes are categorized utilizing a formula known as the Saffir – Simpson scale. This scale rates hurricanes from 1 to 5 based on intensity. The Saffir – Simpson scale, which provides a broad based estimate for potential property damage and anticipated flooding when a hurricane makes landfall is as follows:

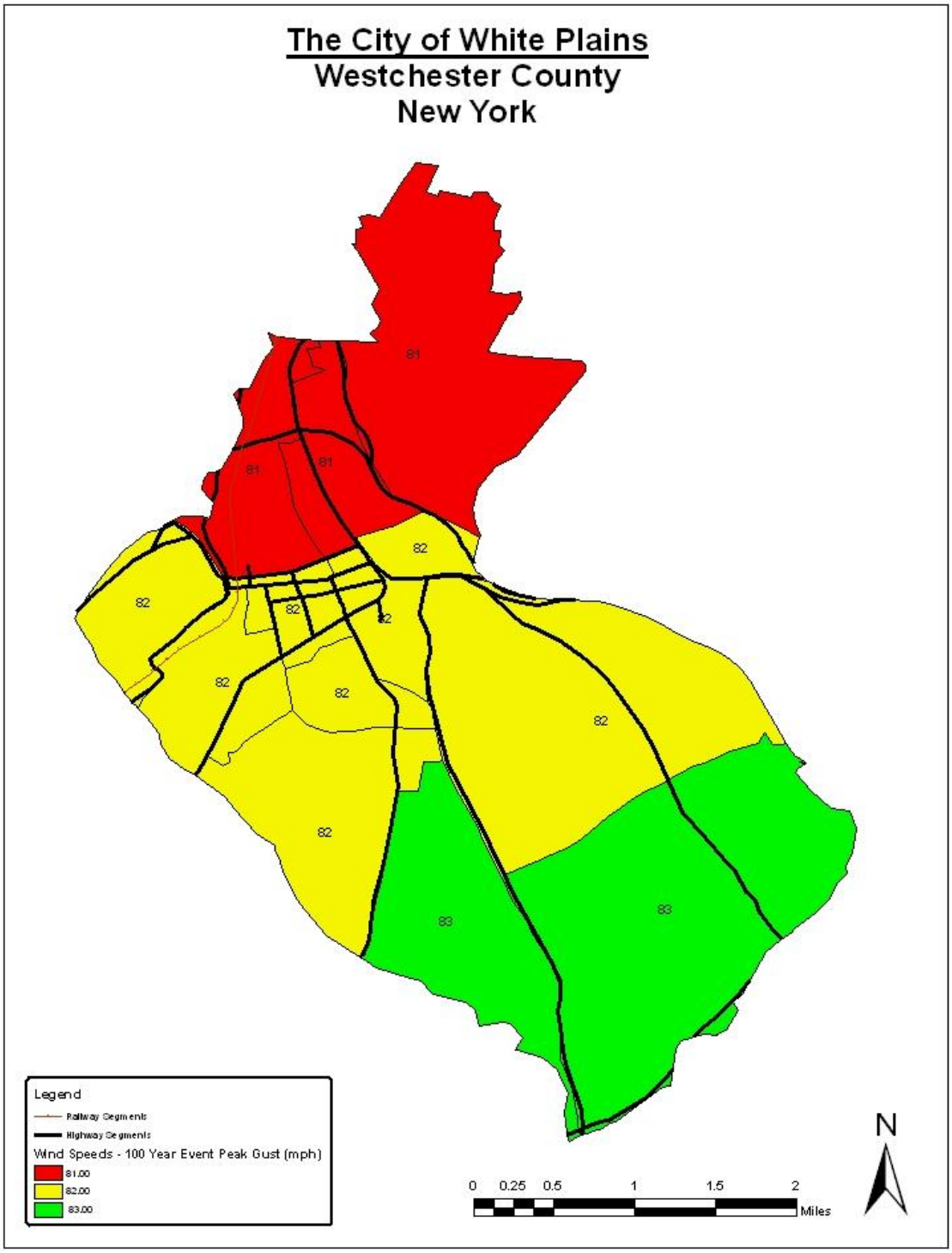
Table 5-26 Saffir – Simpson Scale

Saffir-Simpson Scale

Hurricane Category	Wind Speed MPH	Typical Damage
Tropical Depression	Less than 39	
Subtropical Storm	39-73	
1	74-95	No real damage to buildings. Damage to unanchored mobile homes. Some damage to poorly constructed signs. Some coastal flooding and minor pier damage. Examples: Irene 1999 and Allison 1995
2	96-110	Some damage to building roofs, doors and windows. Considerably damage to mobile homes. Flooding damages piers and small craft in unprotected moorings may break their moorings. Some trees blown down. Examples: Bonnie 1998, Georges (Fl. And La. 1995)
3	111-130	Some structural damage to small residences and utility buildings. Large trees blown down. Mobile homes and poorly built signs destroyed. Flooding near the coast destroys smaller structures and larger structures damaged by floating debris. Terrain may be flooded well inland. Examples: Keith 2000, Fran 1996, Opal 1995
4	131-155	More extensive curtain wall failures with some complete roof structure failure on small residences. Major erosion on beach areas. Terrain may be flooded well inland. Examples: Hugo 1989 and Donna 1960
5	156 and up	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required. Examples: Andrew 1992 and Camille 1969

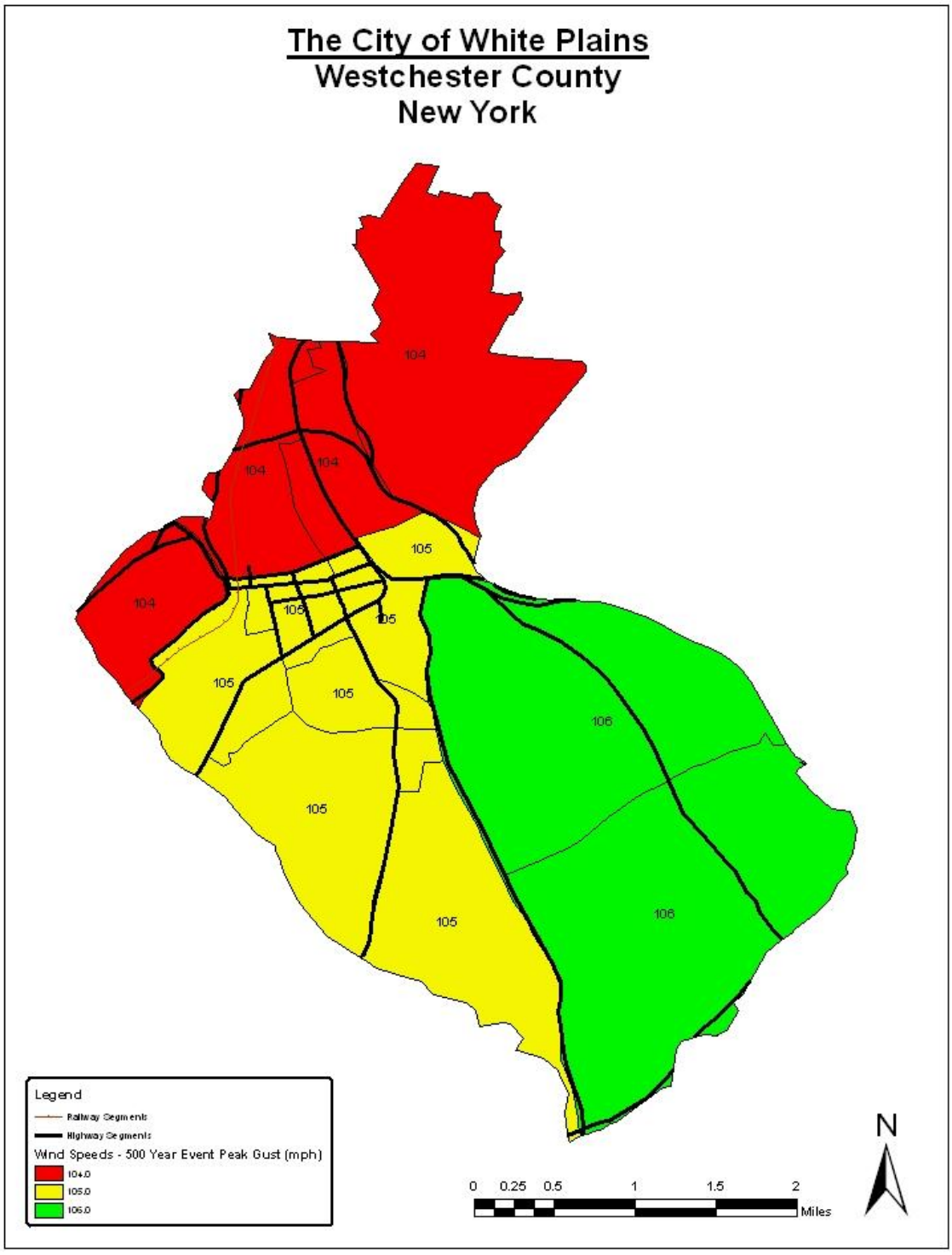
Source: http://www.nhc.noaa.gov/HAW2/english/basics/saffir_simpson.shtml

Figure 5-17 Peak Wind Speeds for 100 Year Hurricane Severe Storm Event



Source: HAZUS-MH

Figure 5-18 Peak Wind Speeds for 500 Year Hurricane Severe Storm Event

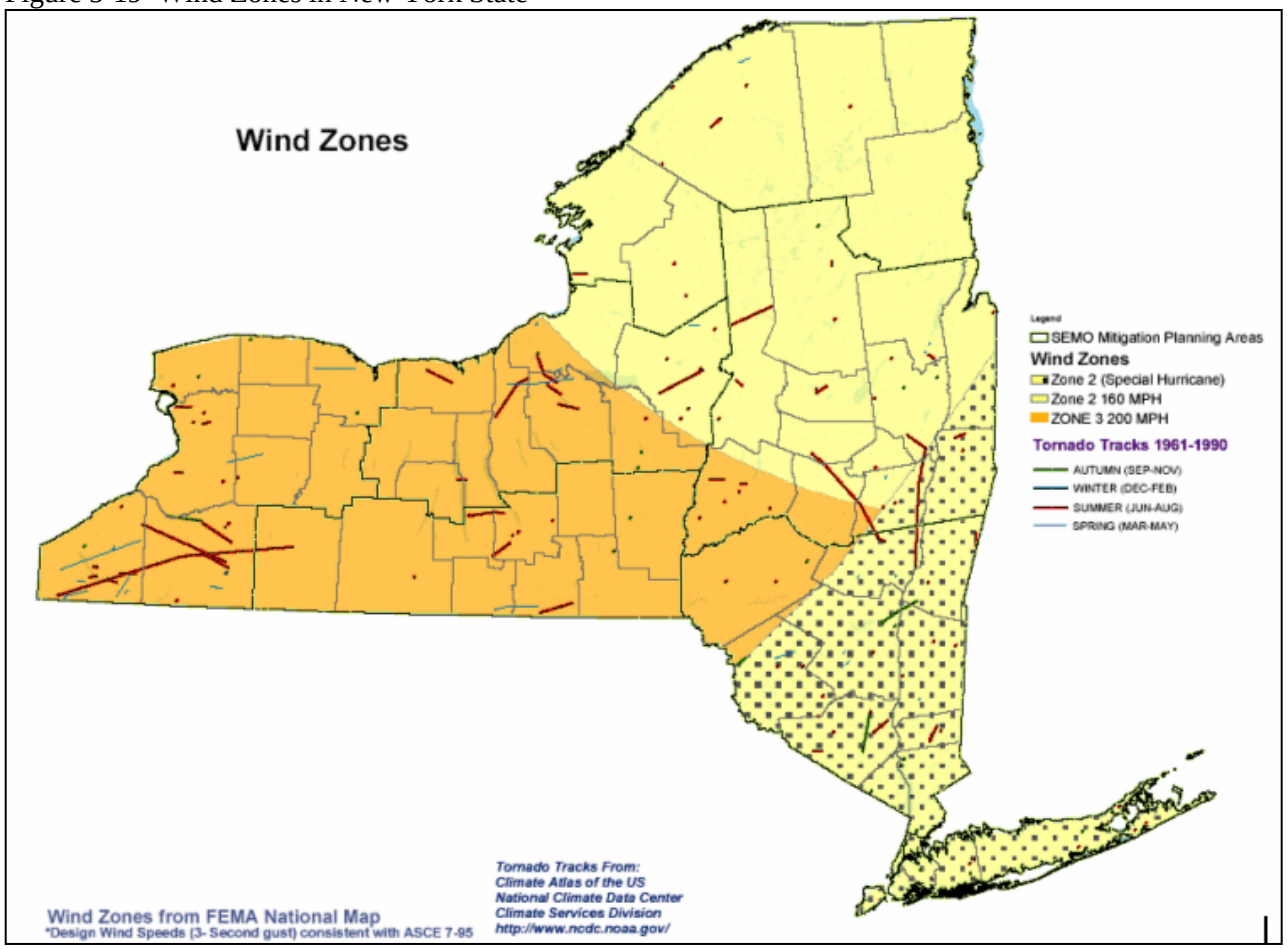


Source: HAZUS-MH

Tornados

Tornados are rotating columns of air marked by a funnel shaped downward extension of a cloud whirling at destructive speeds of up to 300 MPH. They may have the same pressure differential that fuels a 300 mile wide hurricane across a path only 300 yards wide. They can cause damage to property and loss of life. While most tornado damage is caused by violent winds, most injuries and deaths result from flying debris. Property damage can include damage to buildings, fallen trees, power lines, broken gas lines, broken sewer and water mains and the outbreak of fires. Damage from winds and debris can be extensive and occurs in a relatively short period of time. Debris from tornados can cause extensive delays in the response of emergency workers, hamper rescue efforts and disrupt the everyday operations of municipal entities for days or weeks. The Fujita Scale shown in Table 5-27 shows the scale used to measure tornado wings and examples of damages associated with that scale.

Figure 5-19 Wind Zones in New York State



Source: New York State Hazard Mitigation Plan, 2008

Table 5-27 Enhanced Fujita Scale

Enhanced Fujita Scale

Scale	Wind Estimate*** MPH	Typical Damage Extreme
F0	65-85	Some damage to chimneys; branches broken off trees; shallow – rooted trees pushed over; sign boards damaged.
F1	86-110	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	111-135	Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	136-165	Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	166-200	Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	Over 200	Strong frame houses leveled off foundations and swept away; automobile size missiles fly through the air in excess of 109 yards; trees debarked; incredible phenomena will occur.

Source: http://www.spc.noaa.gov/faq/tornado/ef-scale.html

***Important note about F scale winds: Do not use F-scale winds literally. These precise wind speed numbers are actually guesses and have never been scientifically verified. Different wind speeds may cause similar-looking damage from place to place – even from building to building.

Previous Occurrences and Losses

Severe storms are a frequent occurrence. Since 1992, there have been seven Presidential Declarations associated with Severe Storms in Westchester County, the details of which are shown in Table 5-28.

Table 5-28 Presidential Declaration

Type Event	Date	Declaration Number	Approximate Dollar Value of Losses TVH
Severe Storms and Flooding	November 1996	1146	
Hurricane Floyd	September 1999	1296	
Severe Storms and Flooding	April 2005	1589	
Severe Storms and Flooding	July 2006	1650	
Inland/Coastal Flooding	April 2007	1692	
Severe Storms and Flooding	April 2010	1899	
Hurricane Irene	August 2011	4020	

Source: US Department of Homeland Security – FEMA (http://www.fema.gov/news/disasters_state.fema?id=36#diz)

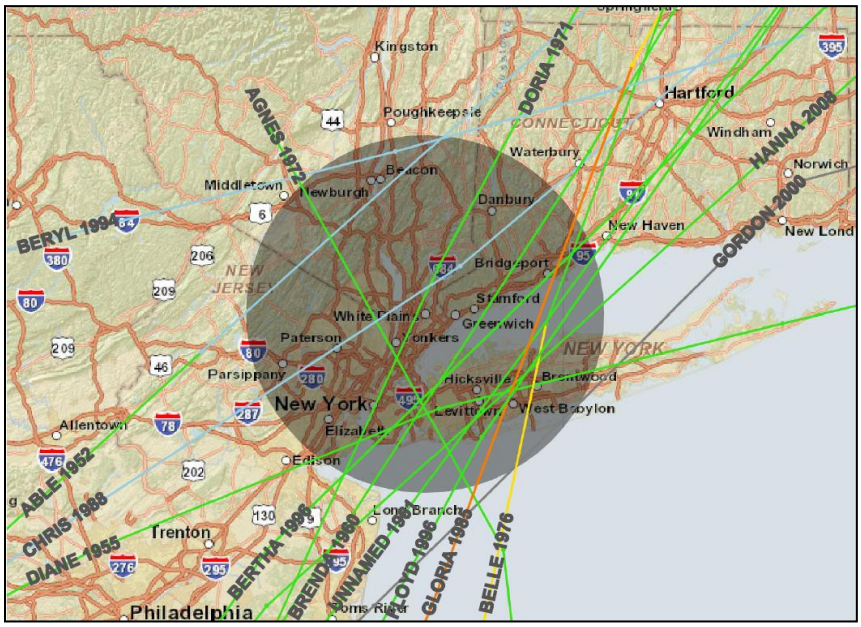
Table 5-29 lists hurricane type events tracking within 50 statute miles of the City of White Plains from 1950 to 2010.

Table 5-29 Hurricanes within 50 statute miles of study area 1950-2010

Name of Hurricane Type Event	Date	Category	Wind Speed (Kts)	Dollar Value of Losses where available
Able	September 1, 1952	Tropical Storm	35	
Diane	August 19, 1955	Tropical Storm	40	
Brenda	July 30, 1960	Tropical Storm	45	
Unnamed	September 15, 1961	Tropical Storm	35	
Doria	August 28, 1971	Tropical Storm	45	
Agnes	June 22, 1972	Tropical Storm	55	
Belle	August 10, 1976	H1	80	
Gloria	September 27, 1985	H2	85	
Chris	August 30, 1988	Tropical Depression	20	
Beryl	August 18, 1994	Tropical Depression	15	
Bertha	July 13, 1996	Tropical Storm	60	
Floyd	September 17, 1996	Tropical Storm	50	
Gordon	September 20, 2000	Extratropical	25	
Hanna	September 7, 2008	Extratropical	45	

Source: NOAA – Historical Hurricane Tracks

Figure 5-20 Historical North Atlantic Tropical Cyclone Tracks (1950-2010 Tracking Within 50 Statute Miles of Study Area)



Source: NOAA – Historical Hurricane Tracks

Tornados

Since 1971, Westchester County has experienced 8 recorded Tornados rising in intensity from F0 to F2. Records do not indicate any having directly impacted the City of White Plains. The most recent tornado (as reported in the Journal News on July 13, 2006) to strike within close proximity of the City of White Plains occurred on July 12, 2006 and had a magnitude of F2, injured 6 people and caused $10,100,000 in property damage. This tornado touched down just south of the Tappan Zee Bridge in Rockland County and traveled in a generally northeast direction through the Town of Mount Pleasant, into the Town of North Castle (immediately north of the City of White Plains) and on into Fairfield County Connecticut.

Table 5-30 Tornados impacting Westchester County 1971-2011

Location by County	Date	Time (24 hr. clock)	Magnitude	Deaths	Injuries	Property Damage
Westchester	08/11/1971	10:30	F1	0	0	$25,000
Westchester	09/01/1974	23:50	F1	0	0	$250,000
Westchester	09/26/1977	15:15	F	0	0	$25,000
Westchester	11/16/1989	10:15	F0	0	0	$0
Westchester	06/12/1991	14:10	F0	1	0	$25,000
Westchester	09/03/1992	16:10	F0	0	0	$0
Peekskill	06/02/2000	18:05	F1	0	2	$0
Tarrytown	07/12/2006	14:37	F2	0	6	$10,100,000

Source: NOAA Satelitte and Information Services (http:// www4.ncdc.noaa.gov/cgi-win/wwcgi.d11?wwevents-storms)

Probability of Future Events

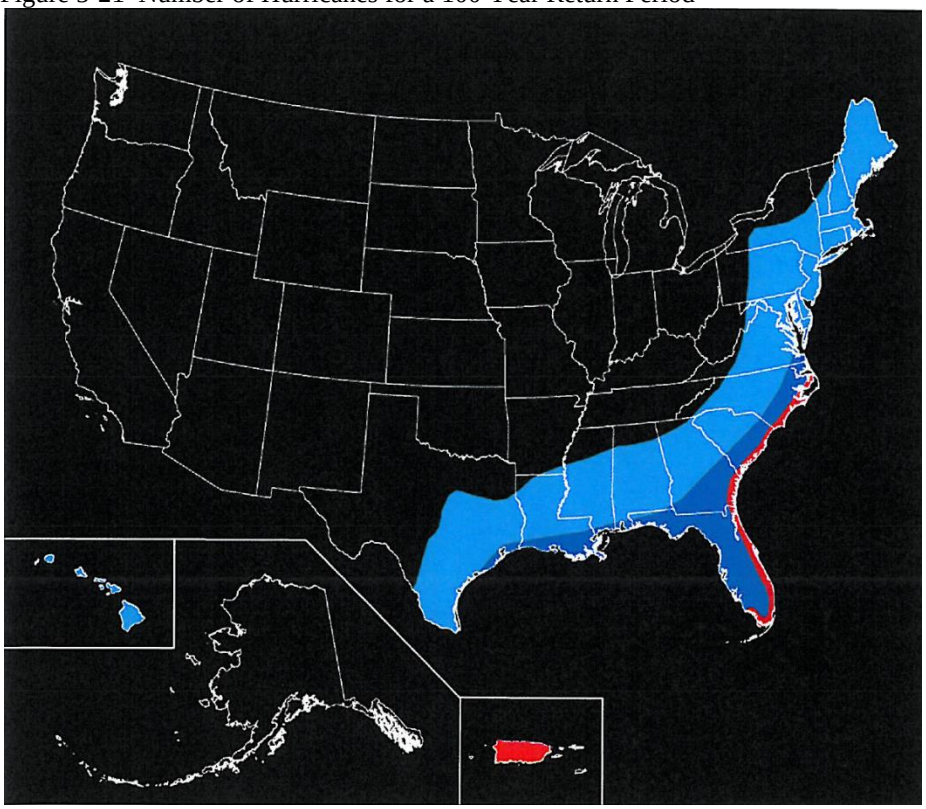
Because natural hazards are only broadly predictable, the incidence of future events can only be expressed as probabilities. This presents a problem because what may be perfectly rational and useful to a mathematician may be confusing or even counterproductive to the public and their decision-makers. The probability of occurrence of earthquakes, floods, and high winds is commonly expressed by use of the term "return period" or "mean recurrence interval." This is defined as the average or mean time in years between the expected occurrences of an event of specified intensity. Values for high winds are commonly expressed in codes as a 50-year return period, much shorter than earthquakes because their incidence is much more frequent. Floods are expressed as a 100-year return period (i.e., the "100-year flood"). To the public, these return periods seem very long (i.e., why would a business owner confronting small crises every day and large ones every month be worried about an event that might not occur for 500 years). The problem is that these figures represent mean or average return periods over a very long period of time, with the result that the return period is often quite inaccurate in relation to the shorter time periods in which most of us are interested (i.e., the next year or the next 10 years). Because high winds are relatively frequent, the discrepancy between the actual return period and the mean return period used in tables is much more noticeable than the corresponding probabilities for earthquakes. Currently, these statements of probability are the best available. Because they express mean values over long periods of time, they tell little about what will really happen this year or next year, but they may give a hint as to what will happen in our lifetime. For purposes of this report, we must assume that disastrous hazards may occur at any time.

Table 5-31 Return Period in Years for Hurricane by Category for Westchester County

Category	Wind Speed (in MPH)	Return Period
1	74-95	17
2	96-110	39
3	111-130	68
4	131-155	150
5	>155	370

Source: NOAA NHC (http://nhc.noaa.gov/HAW2/english/basics/return.shtml)

Figure 5-21 Number of Hurricanes for a 100 Year Return Period



Source: USGS (http://www.usgs.gov/hazards/hurricanes/)

Previously, hazards for the City of White Plains were ranked similar to what had been done for hazards that affect the entire State of New York. The likelihood of a particular type of hazardous event occurring is one parameter used in ranking. Based on historical data found in Federal, State and Local records, as well as input from the HMPC, the likelihood of a severe storm occurring is frequent (more than once every 5 years). In all likelihood, the City of White Plains will continue to experience severe storms. The USGS figure above indicates that the City of White Plains would be susceptible to 20-40 hurricanes in a 100 year period.

Vulnerability Assessment

A vulnerability assessment is defined as assessing the vulnerability of people and the built environment to a given level of hazard. After identifying types of risk, a vulnerability analysis can help to determine the weak points in the community. This assessment examines the vulnerability of the existing and future built environment, such as structures, utilities, roads and bridges, as well as environmental vulnerability, such as open space that can suffer from erosion. Once the geographic areas of risk are identified in the City of White Plains, vulnerability can be assessed for the population, property and resources at risk in those areas. Vulnerability indicates what is likely to be damaged by the identified hazards and how severe the damage may be. For example, if an area is determined to be at risk of flooding, vulnerability estimates for that area could include residential property losses, impacts to the tax base and damages to public infrastructure. Severe storm events can impact the entire City of White Plains. All assets including population, structures, critical facilities and utilities are vulnerable. The following sections evaluate and estimate the potential impact of severe storms:

- Overview of vulnerability
- Data and methodology used in the evaluation
- Impact on life, safety and health
- Identifying structures including general building stock, critical facilities and critical infrastructure
- Economic impact
- Addressing Repetitive Loss Properties (NFIP data for floods, other hazards as available)
- Estimating Potential Losses
- Analyzing Development Trends (new buildings, critical facilities, and infrastructure)
- Additional Data and Next Steps
- Overall vulnerability conclusion
- Multi-jurisdictional Risk Assessment

Overview of Vulnerability

The most hazardous element of all severe storms is wind. High winds typically generate damage to both the natural and physical environments. When such events occur, lives may be placed at risk when individuals are not properly sheltered. Damage to structures, infrastructure and trees and disruption of electrical service can generate millions of dollars in damages. The debris generated by wind damage restricts the free and unimpeded access to places of work, hinders the ability to transport goods and provide services, and typically disrupts the ability to carry out routine municipal service functions over several days or longer.

Until recently, hurricanes with accompanying wind and rain were considered the most severe threat to the City of White Plains. Similar severe storms such as Nor'easters and sustained thunderstorms have caused extensive damage to areas of the community in recent years. These events have caused isolated flooding events throughout the community. The flood hazard is discussed elsewhere in the plan.

The entire municipality is susceptible to damage from severe storm events. Specific areas such as floodways are more vulnerable due to flooding and debris carried by floodwaters.

Various types of constructed facilities can have direct exposure to high winds while others are sheltered behind low lying hills and other structures.

Data and Methodology

Recent changes in Hazard Mitigation Plan development by FEMA Region II, requires the utilization of the FEMA HAZUS-MH software and associated guidance in the study a hurricane's potential for damage and losses in a municipality. In addition to the use of HAZUS-MH, other federal agency data bases including but not limited to (NOAA, USGS), New York State databases, local archives and the knowledge of individuals on the HMPC as well as input from the general public were used in developing the analysis.

The majority of information provided by HAZUS-MH is historical in nature based on records maintained by a variety of Federal agencies. Naturally occurring terrain and tree coverage features are also available for analyzing wind over various types of terrain. Hurricane and constructed features data are available in HAZUS-MH and were utilized to evaluate losses from 100 and 500 year event return periods. Locally available inventory data were reviewed and included as part of the analysis where appropriate. Residential and commercial classes of facilities were combined to make the data more manageable and are identified in the Building Stock Tables later in this section. Critical facilities were evaluated separately from Building Stock.

Impact on Life, Health and Safety

The impact of severe storms on life, health and safety is a function of storm intensity and duration. Temporary and long-term sheltering / displacement can create conditions of severe stress and anxiety on anyone, particularly the elderly. The 2000 Census for the City of White Plains indicates that 15.2% of the population is over 65 years of age. Severe Storm events not requiring the displacement of individuals or families are no less severe. High winds, loss of power, damage to homes, downed trees and the inability to travel and move about freely all have the potential for causing injury and in extreme cases, loss of life. The Tables below are associated with Hurricane Severe Storm Events.

Table 5-32 Sheltering Requirements (Hurricane Event)

Category	100 Year Event	500 Year Event
Households Displaced	10	276
Persons Seeking Temporary Shelter	3	73

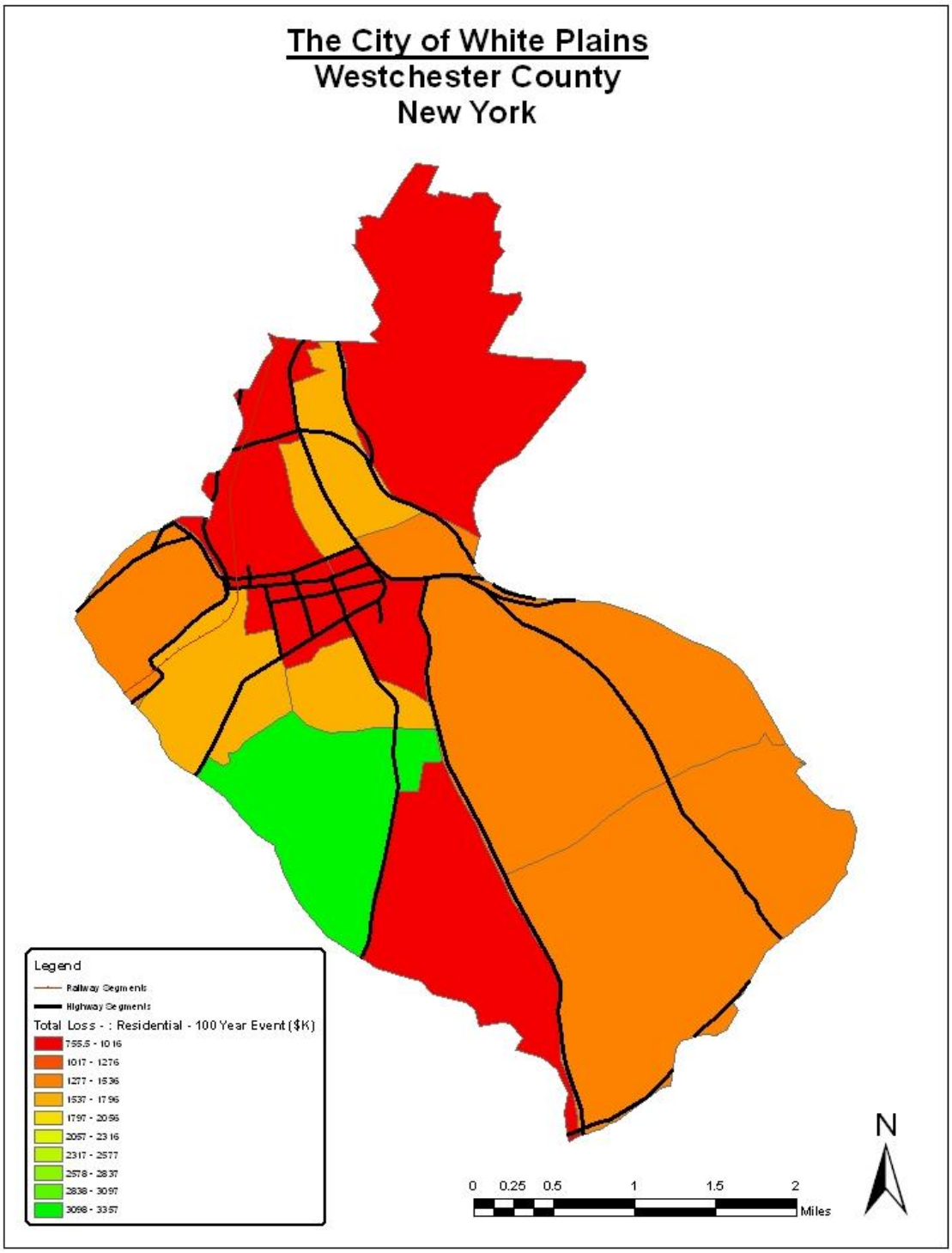
The 100 and 500 year mean return period is utilized for evaluating damage and the associated value of general building stock. The following Tables and Figures summarize building occupancy by class in the study area.

Table 5-33 Building Occupancy by Class

Building Occupancy Class	Number of Buildings	Exposure Value ($1,000)	Percent of Total Exposure Value
Agriculture	95	16,034	0.8
Commercial	1,415	1,919,291	11.6
Education	59	73,101	0.5
Government	80	92,462	0.7
Industrial	360	276,289	2.9
Residential	10,086	3,809,353	82.6
Religion	114	107,387	0.9
Total	**12,209**	**6,293,917**	**100%**

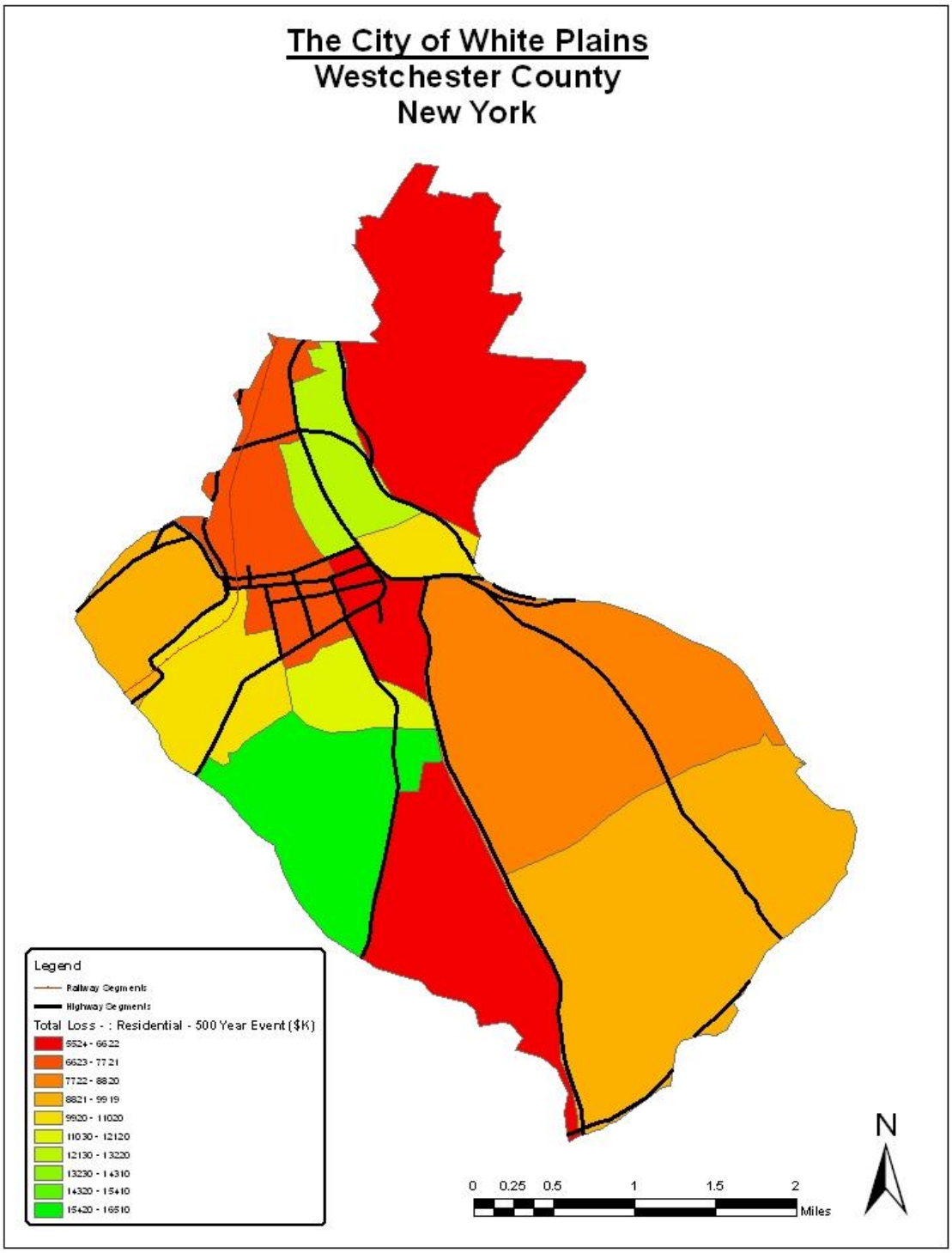
Source: HAZUS-MH

Figure 5-22 Density of Losses for Residential Structures for the 100 Year MRP Hurricane Wind



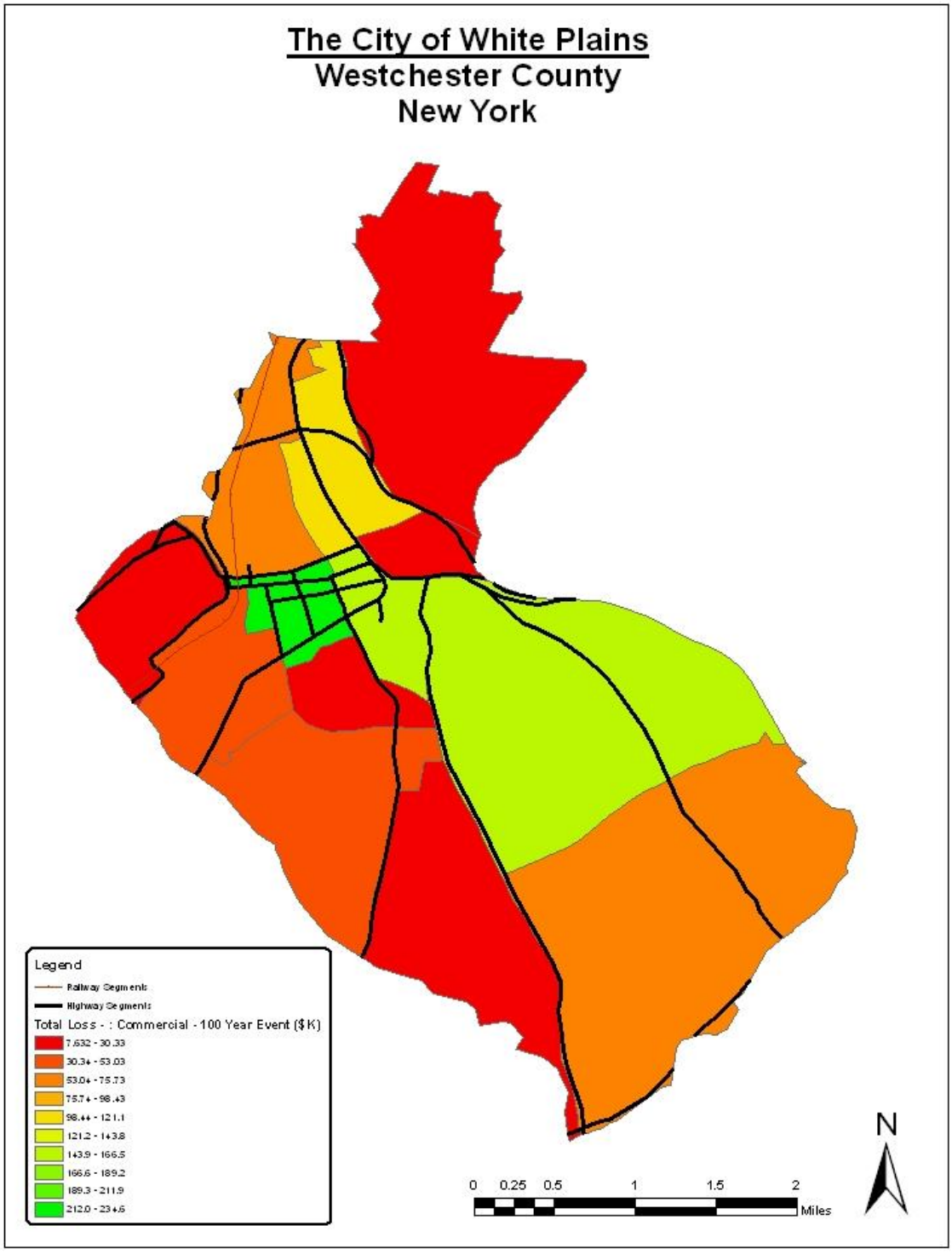
Source: HAZUS-MH Municipal Boundary is the Study Area Generated in HAZUS-MH Based on Census Blocks and Tracts

Figure 5-23 Density of Losses for Residential Structures for the 500 Year MRP Hurricane Wind



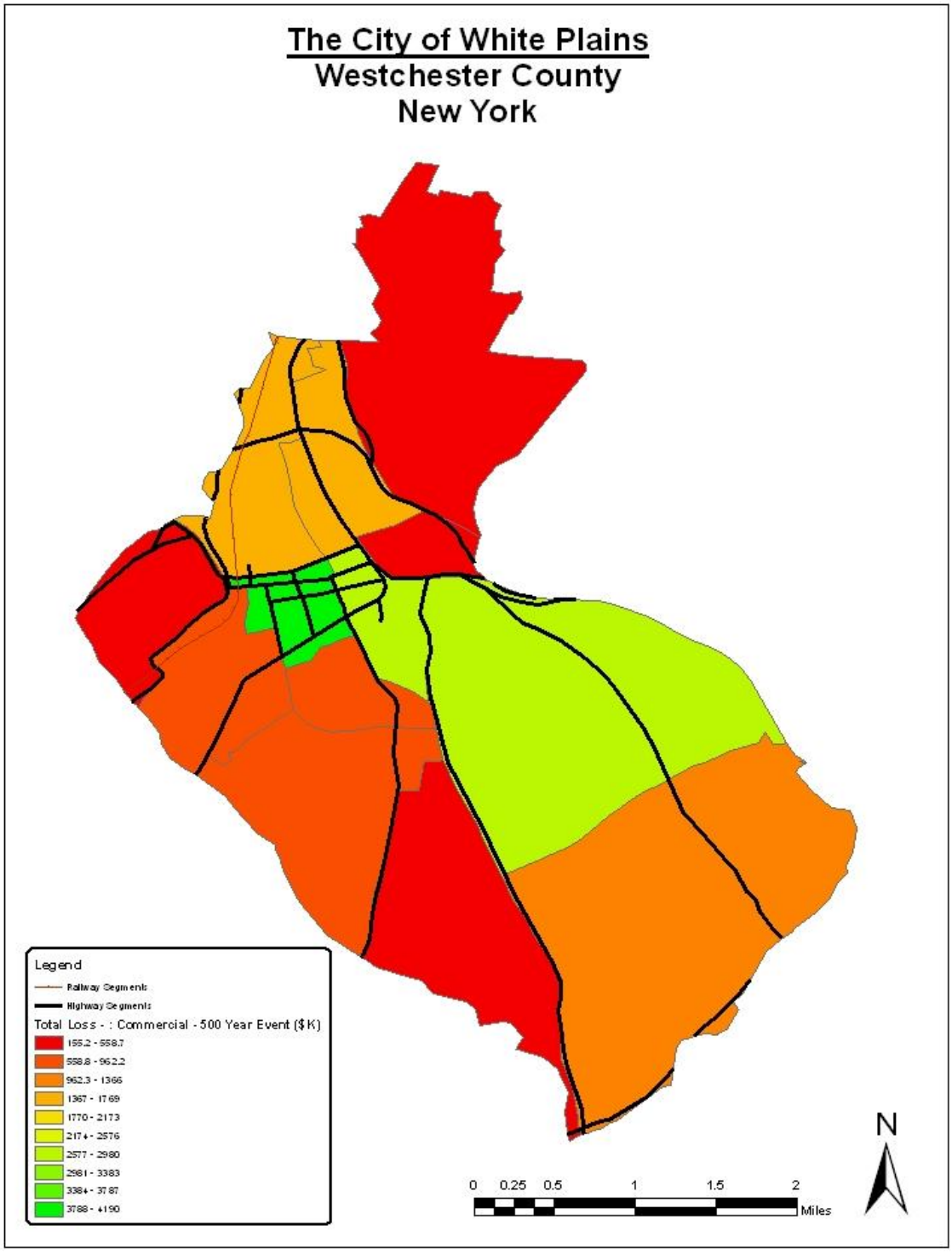
Source: HAZUS-MH Municipal Boundary is the Study Area Generated in HAZUS-MH Based on Census Blocks and Tracts

Figure 5-24 Density of Losses for Commercial Structures for the 100 Year MRP Hurricane Wind



Source: HAZUS-MH Municipal Boundary is the Study Area Generated in HAZUS-MH Based on Census Blocks and Tracts

Figure 5-25 Density of Losses for Commercial Structures for the 500 Year MRP Hurricane Wind



Source: HAZUS-MH Municipal Boundary is the Study Area Generated in HAZUS-MH Based on Census Blocks and Tracts

Economic Impact

HAZUS-MH was utilized to estimate economic losses for buildings. Building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

Tables 5-34 and 5-35 show the estimated building related economic loss estimates for 100 and 500 year hurricane events.

Table 5-34 Building Related Economic Loss Estimates 100 Year MRP Event (Thousands of Dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage	Building	14,338.19	930.21	91.29	96.33	15,456.02
	Content	3,211.69	28.06	2.89	0.40	3,243.04
	Inventory	0.00	0.18	0.59	0.05	0.81
	Subtotal	*17,549.88*	*958.45*	94.77	*96.77*	*18,699.87*
Business Interruption Loss	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	469.73	11.75	0.72	0.55	482.74
	Rental	496.54	0.00	0.00	0.00	496.54
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	*966.27*	*11.75*	*0.72*	*0.55*	979.28
Total	**Total**	**18,516.15**	**970.20**	**95.49**	**97.32**	**19,679.15**

Source: HAZUS-MH

Table 5-35 Building Related Economic Loss Estimates 500 Year MRP Event (Thousands of Dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage	Building	90,805.18	10,145.72	1,517.47	1,303.65	103,772.01
	Content	20,980.45	1,988.83	742.94	229.15	23,941.38
	Inventory	0.00	27.64	90.82	7.30	125.77
	Subtotal	*111,785.63*	*12,162.19*	*2,351.23*	*1,540.11*	*127,839.16*
Business Interruption Loss	Income	0.00	1,643.69	22.85	174.06	1,840.61
	Relocation	4,055.23	1,659.43	130.41	234.50	6,079.57
	Rental	4,100.11	983.24	22.83	32.70	5,138.89
	Wage	0.00	1,466.26	37.43	944.96	2,448.64
	Subtotal	*8,155.34*	*5,752.63*	*213.53*	*1,386.22*	*15,507.72*
Total	**Total**	**119,940.97**	**17,914.82**	**2,564.75**	**2,926.32**	**143,346.88**

Source: HAZUS-MH

Assessing Repetitive Loss Properties

The National Flood Insurance Program provides information on payments to homeowners resulting from losses due to flooding. Under the severe storm (hurricane) category, flooding may be a secondary or resulting event brought about by extended periods of rain and wind. Flooding events, repetitive loss properties and the associated analysis are discussed elsewhere in this report.

Estimating Potential Losses

The HAZUS-MH software program was utilized to determine loss information associated with hurricane wind damage.

Table 5-36 Expected Building Damage by Occupancy (100 Year Event)

	None	None	Minor	Minor	Moderate	Moderate	Severe	Severe	Destruction	Destruction
Occupancy	Count	%	Count	%	Count	%	Count	%	Count	%
Agriculture	94	98.55	1	1.29	0	0.12	0	0.03	0	0.00
Commercial	1,396	98.64	18	1.26	1	0.09	0	0.00	0	0.00
Education	58	98.77	1	1.21	0	0.02	0	0.00	0	0.00
Government	79	98.83	1	1.16	0	0.01	0	0.00	0	0.00
Industrial	355	98.69	5	1.27	0	0.04	0	0.00	0	0.00
Religion	113	98.89	1	1.08	0	0.03	0	0.00	0	0.00
Residential	9,850	97.66	203	2.01	33	0.33	0	0.00	0	0.00
Total	**11,945**		**229**		**34**		**0**		**0**	

Source: HAZUS-MH

Table 5-37 Expected Building Damage by Building Type (100 Year Event)

Building	None	None	Minor	Minor	Moderate	Moderate	Severe	Severe	Destruction	Destruction
Type	Count	%	Count	%	Count	%	Count	%	Count	%
Concrete	363	98.20	7	1.77	0	0.03	0	0.00	0	0.00
Masonry	2,249	95.94	75	3.19	20	0.87	0	0.00	0	0.00
MH*	6	99.99	0	0.01	0	0.00	0	0.00	0	0.00
Steel	981	98.62	13	1.31	1	0.07	0	0.00	0	0.00
Wood	8,385	98.64	110	1.29	5	0.06	0	0.00	0	0.00

Source: HAZUS-MH *MH= Manufactured Housing

Table 5-38 Expected Damage to Essential Facilities (Number of Facilities) 100 Year Event

Classification	Total	Probability of at Least Moderate Damage >50%	Probability of Complete Damage >50%	Expected Loss of Use <1 Day
EOCs	1	0	0	1
Fire Stations	8	0	0	8
Hospitals	2	0	0	2
Police Stations	1	0	0	1
Schools	16	0	0	16

Table 5-39 Expected Building Damage by Occupancy (500 Year Event)

	None	None	Minor	Minor	Moderate	Moderate	Severe	Severe	Destruction	Destruction
Occupancy	Count	%	Count	%	Count	%	Count	%	Count	%
Agriculture	76	80.51	13	14.13	3	3.48	2	1.70	0	0.18
Commercial	1,204	85.06	172	12.12	36	2.54	4	0.8	0	0.00
Education	51	86.65	7	11.49	1	1.78	0	0.08	0	0.00
Government	70	87.99	8	10.46	1	1.5	0	0.06	0	0.00
Industrial	308	85.62	41	11.32	9	2.49	2	0.53	0	0.04
Religion	97	85.24	15	12.97	2	1.70	0	0.08	0	0.00
Residential	7,769	77.03	1,788	17.73	510	5.06	14	0.14	5	0.05
Total	**9,576**		**2,043**		**562**		**22**		**5**	

Source: HAZUS-MH

Table 5-40 Expected Building Damage by Building Type (500 Year Event)

Building	None	None	Minor	Minor	Moderate	Moderate	Severe	Severe	Destruction	Destruction
Type	Count	%	Count	%	Count	%	Count	%	Count	%
Concrete	306	82.74	51	13.81	13	3.39	0	0.06	0	0.00
Masonry	1,727	73.70	367	15.65	245	10.44	4	0.18	1	0.03
MH	6	98.20	0	1.31	0	0.45	0	0.00	0	0.04
Steel	855	85.96	108	10.90	27	2.69	4	0.45	0	0.00
Wood	6,820	80.24	1,481	17.43	183	2.15	12	0.15	4	0.04

Source: HAZUS-MH MH= Manufactured Housing

Table 5-41 Expected Damage to Essential Facilities (Number of Facilities) 500 Year Event

Classification	Total	Probability of at Least Moderate Damage >50%	Probability of Complete Damage >50%	Expected Loss of Use <1 Day
EOCs	1	0	0	1
Fire Stations	8	0	0	8
Hospitals	2	0	0	2
Police Stations	1	0	0	1
Schools	16	0	0	16

Table 5-42 Debris Generated (Tons)

Category	100 Year Hurricane Event	500 Year Hurricane Event
Other Tree Debris	469	1,962
Brick/Wood	2,050	15,841
Concrete/Steel	0	0
Eligible Tree Debris	1,484	6,161
Total	**4,003**	**23,964**

Source: HAZUS-MH

Additional Data and Next Steps

Wind and associated airborne debris has been determined to be the most significant element of severe storm events to which the study area is exposed. High winds can topple and damage trees, causing secondary damage to homes and aboveground utilities. Part of any municipality's hazard mitigation plan is a strong educational effort informing residences and businesses as to how they can protect their

property and that of their neighbor through proper maintenance of trees and securing of potential windblown objects. A more detailed analysis of damage following significant wind associated events such as tornados will assist FEMA in expanding the modeling capabilities of HAZUS-MH.

Overall vulnerability conclusion

The severe storm hazard has been determined to be a significant event and has ranked as a high risk for the City of White Plains.

Hazard Profile – Severe Winter Storm

Winter storms have been characterized by the City of White Plains Mitigation Planning Committee as the 3rd most severe hazard event to which the study area is susceptible. Because storm intensity and duration can vary extremely from year to year, the City of White Plains must always be prepared for a worst case scenario event. Winter storms can include heavy snow, ice and blizzard conditions. Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. The cost of snow removal, damage repair, and business losses can have a tremendous impact on the study area. Communications and power can be disrupted for days until damage can be repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents can result with injuries and deaths. Information for this hazard was taken from the below listed as well as other sources:

- *Northeast Regional Climate Center (NRCC) based at Cornell University.* A review of the climatic conditions of New York State, and their effects upon persons, property, and economics. This document was obtained from the following Cornell University web site http://nysc.eas.cornell.edu/climate_of_ny.html. The center is a partner of the National Climatic Data Center. The NRCC contact person is Keith Eggleston.
- *NOAA Satellite and Information Services and National Climate Data Center.* This web-based database maintains the records for many types of disasters dating back to 1950, and allows users to make queries by state, disaster type, and time period, etc.
- *City of White Plains Department of Public Works files*

The following chart provides the definition of a winter storm:

Table 5-43 Severe Winter Storm Definition

Term	Definition
Winter Storm	Includes ice storms, blizzards, and can be accompanied by extreme cold. The National Weather Service characterizes blizzards as being combinations of winds in excess of 35 miles per hour with considerably falling or blowing snow, which frequently reduces visibility.

Source: NYSEMO 2008 Hazard Mitigation Plan

Winter storms are a common seasonal occurrence in the City of White Plains although individual storm intensity and duration can vary widely. The most damaging and costly winter season in recent memory is 1996 in the particular months of January, February and March. Municipal public works officials can testify that "it felt like it snowed every 48 hours from January through early March". Road deicing materials (salt) were in short supply at one point and deliveries became sporadic and less than what was ordered due to transportation problems associated with distribution points. The estimated 18 to 24 inches that fell during the January 1996 Blizzard required a request for assistance to the New York National Guard. Military personnel and equipment assisted the overburdened municipal work force with snow removal following the actual storm event.

Geographic Location and Extent

The entire City of White Plains is susceptible to winter storms. The Northeast Regional Climate Center (NRCC) based at Cornell University in Ithaca, New York states that the mean snowfall for the study area is 40 to 50 inches annually. A typical snow event can range from a dusting to more than 12 inches. Several factors will determine the severity of a severe winter storm including temperature, wind speed, type of precipitation, day or nighttime event as well as when in the winter season the storm occurs. Typical categories of severe winter storms include heavy snow, blizzard, sleet or freezing rain and ice storms.

The Northeast Snowfall Impact Scale (NESIS) developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service characterizes and ranks high-impact Northeast snowstorms. These storms have large areas of 10 inch snowfall accumulations and greater. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus NESIS gives an indication of a storm's societal impacts. This scale was developed because of the impact Northeast storms can have on the rest of the country in terms of transportation and economic impact. (http://www.ncdc.noaa.gov/oa/climate/research/show-nesis/)

Table 5-44 Northeast Snowfall Impact Scale

NESIS Snowstorm Category	NESIS Value (Snowfall in Inches)	Description
1	1-2.499	Notable
2	2.5-3.99	Significant
3	4-5.99	Major
4	6-9.99	Crippling
5	10+	Extreme

Source: http://www.ncdc.noaa.gov/oa/climate/research/snow-nesis/#rankings

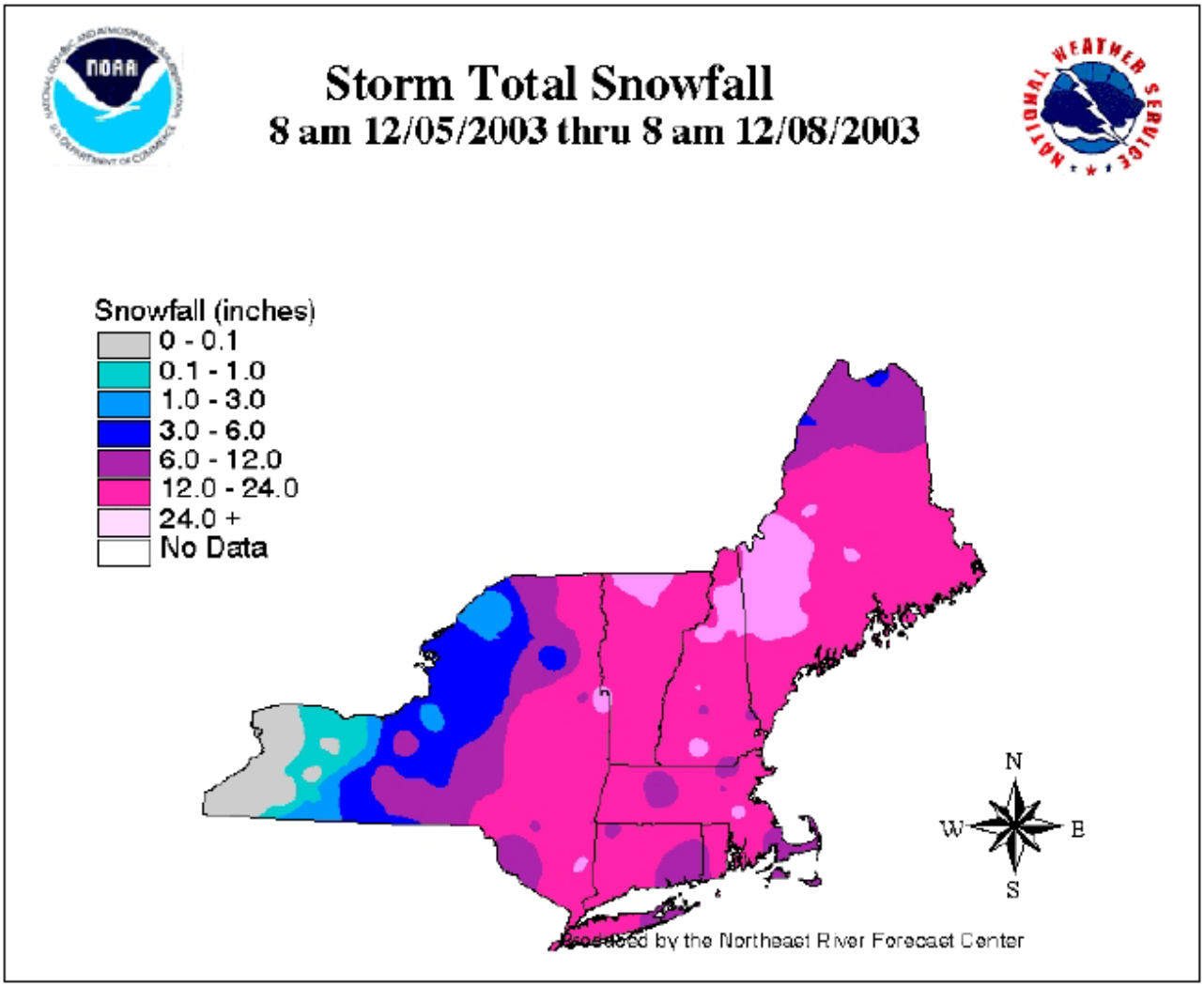
Severe winter storms have the ability to disrupt municipal operations and the everyday lives of people over periods of one to several days. Schools and businesses may be closed; municipal workers may be forced to defer routine services in order to clear roads of snow. Snow and ice have the ability to down trees and power lines which can cause homes and businesses to be without the ability to provide heat. Municipal snow and ice control equipment vehicles may cause damage to roads and bridges as a result of several freeze and thaw cycles as well as cumulative damage from road salt and other chlorides.

Previous Occurrences and Losses

Westchester County and the City of White Plains have experienced some 72 snow / ice storms of varying intensities between January 1950 and April 2011 according to the NOAA National Climatic Data Center. Presidential Disaster Declarations for Severe Winter Storm Events are listed in Table 5-45. The **NEWS FROM THE NORTHEAST REGIONAL CLIMATE CENTER** reported the following on the January 1996 "Blizzard of 96".

ITHACA, N.Y. – While much of the eastern United States digs out from the Blizzard of ’96, the snow has stopped falling but snowfall records continue to fall and storm-related anecdotes pile up, according to climatologists from the Northeast Regional Climate Center at Cornell University. Philadelphia and parts of New Jersey were hammered by the greatest one-storm, snowfall totals ever. In Philadelphia, the storm left 30.7 inches of snow, breaking the old one-storm snowfall total by 9.4 inches – the previous record was the Feb. 11-12, 1983, storm that blanketed the City of Brotherly Love with 21.3 inches of snow. This week’s blizzard exceed the 12 inches of snow left during 1993’s so-called “Storm of the Century.” The all-time record snowfall for New Jersey – 34 inches in coastal Cape May, in February 1889 – was beaten by 1 inch at Whitehouse Station in northeastern Hunterdon County, N.J., which received 35 inches of snow through Jan. 9. The snowfall record in Newark, N.J.
-22.6 inches set of Feb. 3-4, 1961 – did not measure up to the 1996 blizzard’s 27.8 inches. The 1993 “Storm of the Century” left but 12.7 inches in Newark, a faint match for this week’s onslaught. Central Park in New York City has recorded 20.2 inches of snow in this storm, making it the third highest snowfall ever there. On parts of nearby Staten Island, N.Y., more than 27 inches of snow fell. LaGuardia International Airport, N.Y., recorded 24 inches of snow, which exceeds the normal for the entire season of 22.6 inches. Most of upstate New York saw little or no snow. The snow line was very pronounced: In Columbia County, N.Y., between Albany and New York City, weather stations such as Ancram, N.Y., recorded 23 inches of snow, while nearby Valataie, N.Y., saw but 2 inches. Scranton, P.A., recorded 21 inches of snow, while Binghamton, N.Y. just to the north of Interstate 81, recorded only a trace of snowfall from this storm. Through the middle Atlantic corridor, the Blizzard of ’96 spared a few places. Dulles International Airport, in the Virginia suburbs of Washington, D.C., had a storm total of 24.6 inches of snow, but set a new 24-hour period record of 19.8 inches. Pocahontas County, W. Va., was pounded with between 40 and 48 inches of snow. Webster County, W. Va., recorded between 24 and 46 inches of the white stuff, and Randolph County, W. Va., experienced between 20 and 40 inches of snow. Petersburg, and Brandwine, W.Va., both received 30 inches of snow. Shenandoah, Va., caught 37 inches of snow from the blizzard or Sperryville Va, had 31 inches.

Figure 5-26 Snowfall for Study Area December 5, 2003 storm event



Source: NOAA

On February 12, 2006, the New York Times reported 16-24 inches of snow had fallen in the New York Metropolitan Area. The snow was accompanied by wind gusts of up to 50 miles per hour. Consolidated Edison Company of New York, which provides electric service to the area, reported 250 crews had been mobilized for response coverage in Westchester County.

Table 5-45 Presidential Disaster Declarations for Severe Winter Storm Events

Type of Event	Date	Declaration Number	Municipal Assistance in Dollars
Nor'easter (winter storm)	December 1992	DR-0974	
Severe Blizzard	March 1993	EM-3107	
Blizzard	January 1996	DR-1083	
Snowstorm	March 2003	EM-3184	

Source: FEMA Presidential Declarations

Probability of Future Events

The City of White Plains lies within high latitudes thus making the study area prone to winter storm events. The study area over time can meet the mean average snowfall of 40 to 50 inches. Based on historical records, input from the HMPC and the institutional memory of municipal officials, the probability of occurrence for a severe winter storm in the City of White Plains is considered frequent (likely to occur more than once every 5 years).

Vulnerability Assessment

A vulnerability assessment is defined as assessing the vulnerability of people and the built environment to a given level of hazard. After identifying types of risk, a vulnerability analysis can help to determine the weak points in the community. This assessment examines the vulnerability of the existing and future built environment, such as structures, utilities, roads and bridges, as well as environmental vulnerability, such as open space that can suffer from erosion. Once the geographic areas of risk are identified in the City of White Plains, vulnerability can be assessed for the population, property and resources at risk in those areas. Vulnerability indicates what is likely to be damaged by the identified hazards and how severe the damage may be. For example, if an area is determined to be at risk of a severe winter storm, vulnerability estimates for that area could include residential property losses, impacts to the tax base and damages to public infrastructure. Severe winter storm events can impact the entire City of White Plains. All assets including population, structures, critical facilities and utilities are vulnerable. The following sections evaluate and estimate the potential impact of severe storms:

- Overview of vulnerability
- Data and methodology used in the evaluation
- Impact on life, safety and health
- Identifying structures including general building stock, critical facilities and critical infrastructure
- Economic impact
- Addressing Repetitive Loss Properties (NFIP data for floods, other hazards as available)
- Estimating Potential Losses
- Analyzing Development Trends (new buildings, critical facilities, and infrastructure)
- Additional Data and Next Steps
- Overall vulnerability conclusion
- Multi-jurisdictional Risk Assessment

Overview of Vulnerability

Severe winter storms are a major concern to the City of White Plains. As with any weather related event, technology allows for advance warnings as to the intensity and severity of such events. Severe winter storms can include heavy snow, ice and blizzard conditions. Heavy snow can immobilize the study area, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. The cost of snow removal, damage repair, and business losses can have a tremendous impact on the study area government. Heavy accumulations of ice can bring down trees, electrical wires and utility poles. Communications and power may be disrupted for days until damage can be repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe

drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents can result with injuries and deaths.

Data and Methodology

Information for this hazard was provided by National, Institutional and Local databases as well as HAZUS-MH which provided population and general building stock information. The City of White Plains provided information with respect to municipal losses and costs associated with cleanups for Presidential Declarations.

Impact on Life, Safety and Health

The disruption of services during a severe winter storm and the ability to move about freely can impact the entire study area's population with particular emphasis on elderly, low and fixed income populations. The elderly are at risk from falls on icy surfaces. Public service transportation may be temporarily disrupted leaving populations with no means of food shopping, attending scheduled appointments and completing everyday activities. Table 5-46 below lists the population most susceptible problems associated with Severe Winter Storms.

Table 5-46 Population Susceptible to Severe Winter Storms

Population Category	Number of Persons Susceptible
Elderly (Over 65 years of age)	8,676
Low Income (Persons living in households with annual incomes less than $25,000 per year)	

Source: Westchester County Department of Planning/2000 US Census

Impact on General Building Stock, Critical Facilities and Infrastructure

All General Building Stock, Critical Facilities and Infrastructure in the study area are susceptible to Severe Winter Storms. Locally available historical data on impacts of this type event is limited. Discussions with municipal officials with respect to critical facilities impact identified leaking roofs as a common occurrence from ice buildup and damage to snow and ice control equipment.

Utilizing HAZUS-MH, possible severe storm damage scenarios were developed for events which could result in damage to the general building stock of .5%, 1%, 2% and 5%. These damage estimates are for information only in order to identify the potential for losses from such a winter storm event. Actual storm related damage data is not available.

Table 5-47 General Building Stock Exposure with Percentage Damage Lost Estimates ($1,000)

Building Occupancy Class	Number of Buildings	Total Value	.5% Damage Loss Estimate	1% Damage Loss Estimate	2% Damage Loss Estimate	5% Damage Loss Estimate
Agriculture	95	16,034	80.17	160.34	320.68	801.70
Commercial	1,415	1,919,291	9596.46	19192.91	38385.82	95964.55
Education	59	73,101	365.51	731.01	1462.02	3655.05
Government	80	92,462	462.31	924.62	1849.24	4623.10
Industrial	360	276,289	1381.45	2762.89	5525.78	13814.45

Residential	10,086	3,809,353	19046.77	38093.53	76187.06	190467.65
Religion	114	107,387	536.94	1073.87	2147.74	5369.35
Total	**12,209**	**6,293,917**	**31,469.59**	**62,939.17**	**125,878.34**	**314,695.85**

Damage to roadways as a result of winter storms is a common occurrence and requires maintenance and repair work once the winter season ends. Freezing and thawing cycles, the application of salt and chloride solutions to roadways creates pavement cracking, potholes and may include loss of overlaid wearing surfaces. Funds to perform this type work are typically incorporated in the Department of Public Works annual operating budget. Other areas where there is a potential for damage from a severe winter storm is the 100 and 500 year floodplain areas. Freezing and thawing cycles, damage to trees and associated debris from ice and heavy snow as well as blocked stormwater conveyance systems have the potential to cause flooding events under the right set of circumstances.

Economic Impact

The fact that severe winter weather is a common occurrence in the study area means that many residents, businesses and visitors are prepared to function to a certain extent under such conditions. Because technology can provide advance warnings for such events, residents will typically stock up on needed flood items before such an event while shopping for other goods and services can be put off and appointments rescheduled. There are no data sources available to determine what impact a severe winter storm has on the economy. For the study area, any impact would be short term, typically a day or two based on past events. The most significant economic impact would be to the financial resources of the City of White Plains local government. Costs to maintain a passable highway network as well as the removal of snow from the roadways and sidewalks, especially in the downtown business areas, can quickly escalate to the tens of thousands or hundreds of thousands of dollars. During the winter storm of January 6-8, 1993, the City of White Plains requested reimbursement under Presidential Declaration DR-1083 amounting to $_____. Additionally the New York National Guard spent several days in the study area and surrounding communities assisting with snow removal.

Addressing Repetitive Loss Properties (NFIP data for floods, other hazards as available)

The National Flood Insurance Program provides information on payments to homeowners resulting from losses due to flooding where a separate insurance policy for such events has been purchased. Under the severe winter storm category, flooding may be a secondary or resulting event brought about by a combination of heavy snows, quickly warming temperatures and rain events before the ground has had time to thaw. Flooding events, repetitive loss properties and the associated analysis are discussed elsewhere in this report.

Estimating Potential Losses

See Table 5-47 above.

Analyzing Development Trends (new buildings, critical facilities and infrastructure)

Section 4 of this plan Municipal Profile – Future Development identifies several areas in the City of White Plains where the potential for development or redevelopment exists. The New York State

Building Code has specific requirements for snow loads on a structure both uniform and concentrated. Severe winter storms have the potential for causing secondary impacts to any development including travel restrictions during such events, power outages, damage from windblown and fallen debris. At the design stage of any such development, these factors should be given consideration particularly in the case of critical facilities and infrastructure.

Additional Data and Next Steps

Data available concerning severe winter storms is limited to municipal services related costs where a Presidential Declaration has been issued as a result of an event. There have been four (4) such declarations since 1992 for the study area. FEMA HAZUS-MH does not provide modeling for Severe Winter Storm events. Some basic loss information was prepared for evaluating a severe winter storms impact utilizing occupancy class, building values and a percentage of loss. Having the ability to monitor and record individual losses associated with individual properties has the potential to lead to the development of models for evaluating severe winter storm related losses.

Overall vulnerability conclusion

The severe winter storm hazard has been determined to be a significant event and has been ranked as a high risk for the City of White Plains.

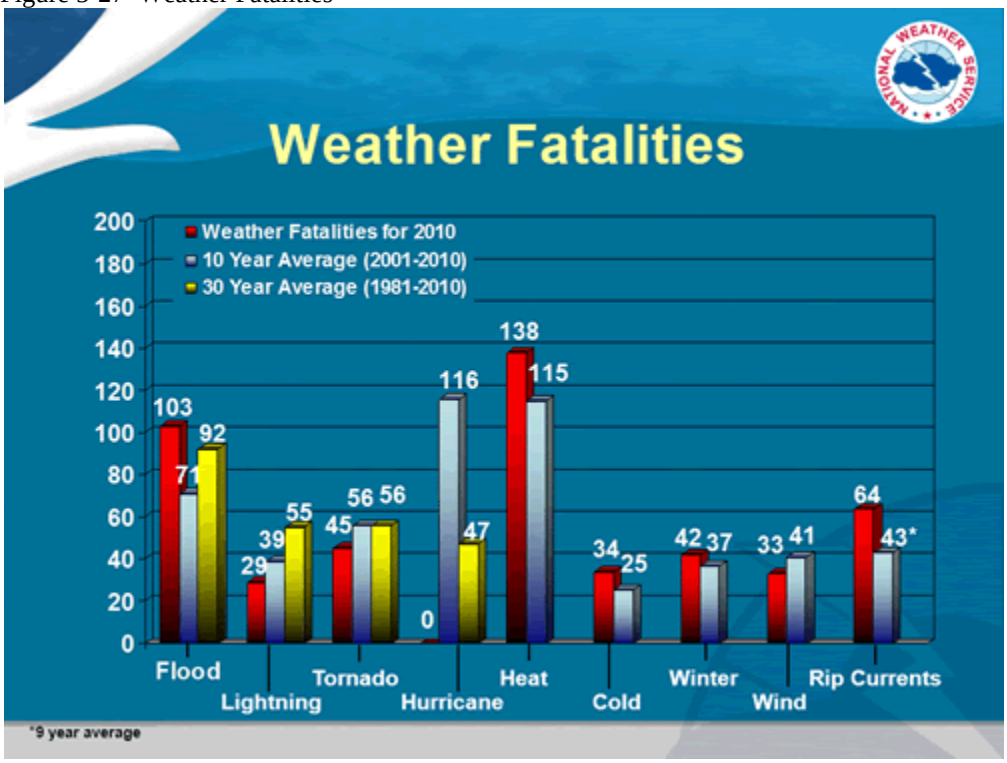
Hazard Profile - Extreme Heat

Description

Extreme Heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Humid and muggy conditions which add to the discomfort of high temperatures occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. Excessive dry and hot conditions can occasionally provoke dust storms and low visibility. Droughts occur when a long period passes without substantial rain. A heat wave combined with a drought creates a very dangerous situation. The National Weather Service has a system in place to initiate alert procedures (advisories or warnings) when the Heat Index (HI) is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued.

There is no information available for heat related fatalities in the study area. In terms of New York State, from 1994 – 2011 there have been 86 fatalities as a result of extreme heat. 79 of the 86 fatalities took place in a period of 7 years, ranging from 1999 – 2011 as shown in Figure 5-27.

Figure 5-27 Weather Fatalities



Source: http://www.weather.gov/om/hazstats.shtml

Location and Extent

The entire study area is susceptible to extreme heat conditions. The severity of such an event is a function of duration, intensity and the impact of extreme heat on public utilities, especially electricity and public water supplies.

Previous Occurrences

The NOAA /NCDC Storm event database contains information on extreme temperature events beginning in 1950 up through the summer of 2008. For these type events, the database indicates that six (6) have occurred in areas including the New York Metropolitan area (Southern Westchester) which includes the City of White Plains since October 1993. Table 5-48 provides a summary of this data.

Table 5-48 Summary of Extreme Temperature Events

Location or County	Date	Time	Type	Death	Injury	Property Damage
Areawide	10/08/1993	0000	Record Heat	0	0	0
NYZ067>081	07/04/1999	01:00 PM	Excessive Heat	33	0	0
NYZ067>078 - 080	08/08/2001	04:00 PM	Excessive Heat	4	1	0
NYZ067>081	07/02/2002	12:00 PM	Excessive Heat	0	0	0
NYZ067>081	07/29/2002	12:00 PM	Excessive Heat	0	0	0
NYZ067>081	08/01/2006	11:00 AM	Excessive Heat	42	0	0

Source: NOAA-NCDC http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
Note: No deaths, injuries or property damage are documented for the study area.

The Westchester County Airport is partially located in the northeast corner of the study area. Information provided by the MyForecast website for the airport indicates that the average high temperature for July is 84 degrees with a recorded high of 107 degrees. The number of days in July where the temperature exceeds 90 degrees was reported as 6.

There have been several instances in recent years where temperatures have exceeded the 10 degree threshold above the high average temperature for periods of several days rather than several weeks. Locally, these type events are also considered extreme heat situations and at times have created the same type situations of the longer period occurring events.

Probability of Future Events

The study area is likely to experience extreme heat in the future. Based on historical records and the experience of members of the HMPC, the probability for such events is frequent (likely to occur more than once every 5 years).

Vulnerability Assessment

The entire study area is susceptible to Extreme Heat. The most rigorously documented impacts are health related based on studies conducted by the U.S. Center for Disease Control and Prevention. The study areas elderly population age 65 and over (approximately 8,676 people) may be severely impacted by prolonged events.

Overview of vulnerability

Historical information for the study area clearly indicates extreme heat is a concern. Periods of extreme heat where temperatures are 10 degrees above the average high for several days can clearly have impacts in such areas as health (especially the elderly), transportation, energy, and water resources. Extreme heat situations can have a cascading affect which can lead to drought restrictions being implemented during an intense or prolonged event.

Data and methodology

Data with respect to past extreme heat events was provided by the NOAA – NCDC and information gathered from websites which record temperatures at the Westchester County Airport located northeast of the study area. HAZUS-MH does not provide any extreme heat related information in its software programs.

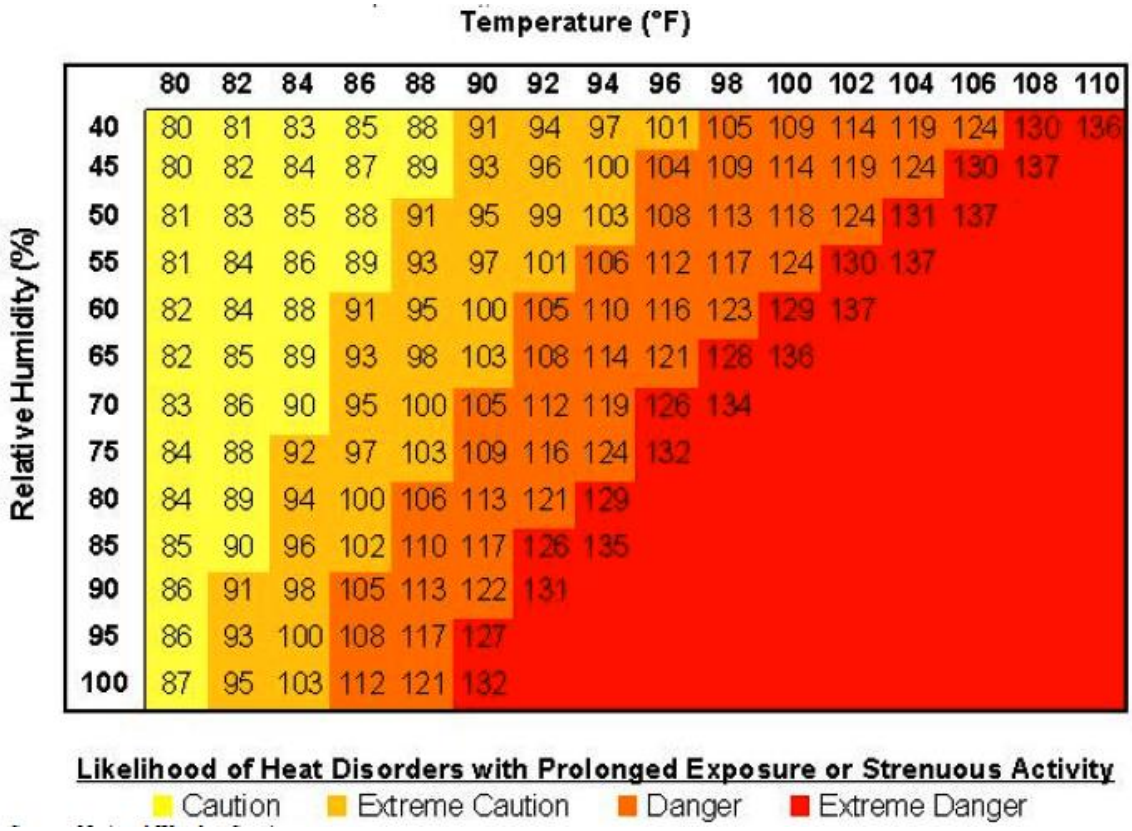
Impact on life, safety and health

According to the Cooperative Institute for Research in the Atmosphere, located at Colorado State University in Fort Collins Colorado, on average over the last 30 years, excessive heat accounts for more reported deaths annually than hurricanes, floods, tornadoes, and lightning combined. Heat kills by taxing the human body beyond its abilities. Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related illness may develop. Elderly persons, small children, chronic invalids, those on certain medications or drugs, and persons with weight and alcohol problems are particularly susceptible to heat reactions, especially during heat waves in areas where moderate climate usually prevails. Table 5-49 illustrates the relationship of temperature and humidity to heat disorders.

The NWS has in place a system to initiate alert procedures (advisories or warnings) when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for the issuance of excessive heat alerts is when the maximum daytime high is expected to equal or exceed 105°F and a nighttime minimum high of 80°F or above is expected for two or more consecutive days.

The Heat Index (HI), created by the National Weather Service is a chart which accurately measures apparent temperature of the air as it increases with the relative humidity. The Heat Index can be used to determine what effects the temperature and humidity can have on the population. Table 5-50 describes the adverse effects that prolonged exposures can have on individuals. To determine the Heat Index, you need the temperature and the relative humidity. Once both values are known, the Heat Index will be the corresponding number with both values. That number provides how it really feels. It is important to know that the Heat Index (HI) values are devised for shady, light wind conditions. Exposure to full sunshine can increase HI values by up to 15 degrees. Also, strong winds, particularly with very hot, dry-air can be extremely hazardous to individuals.

Table 5-49 Accurate measurement of temperature during an extreme heat event



Source: National Weather Service
New York State Hazard Mitigation Plan

Table 5-50 Explanation of Heat Related Disorders

Category	Heat Index	Health Hazards
Extreme Danger	**130°F - Higher**	**Heat Stroke/ Sunstroke is likely with continued exposure.**
Danger	**105°F - 129°F**	**Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and /or physical activity.**
Extreme Caution	**90°F - 105°F**	**Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and /or physical activity.**
Caution	**80°F - 90°F**	**Fatigue possible with prolonged exposure and/or physical activity.**

Source: NYSEMO HMP

The National Weather Service (NWS) provides alerts when Heat Indices approach hazardous levels. Table 5-51 provides the alert procedures for the National Weather Service. In the event of an extreme heat advisory, The National Weather Service does the following:

- Include HI values and city forecasts;

- Issue special weather statements including who is most at risk, safety rules for reducing risk, and the extent of the hazard and HI values;
- Provide assistance to State/Local health officials in preparing Civil Emergency Messages in severe heat waves.

Table: 5-51 National Weather Service Alert Procedures

Product	Criteria
Heat Advisory (NYC)	The NWS issues a Heat Advisory within 24 hours of the onset of the following conditions. Heat Index of at least 100°F but less than 105°F for any period of time, or when nighttime lows are above 80°F for any period of time. (Note: This weather product was modified for New York City. The national definition places the heat index requirement at 105°F).
Excessive Heat Watch	The NWS issues an Excessive Heat Watch within 24 to 48 hours of the onset of the following conditions: Heat Index of at least 105°F for more than 3 hours per day for 2 consecutive days, or a Heat Index of at least 115°F for any period of time.
Excessive Heat Warning	The NWS issues an Excessive Heat Warning within 24 hours of the onset of the following conditions: Heat Index of at least 105°F for more than 3 hours per day for 2 consecutive days, or a Heat Index of more than 115°F for any time period.

Source: NYC Heat Emergency Plan
New York State Hazard Mitigation Plan

Identifying structures including general building stock, critical facilities and critical infrastructure

Typically the only impact extreme heat has on general building stock and critical facilities is increased demand on air conditioning equipment which in turn may cause strain on electrical systems. Public utility infrastructure such as electrical generating and conveyance systems may become damaged and breakdown causing either localized or widespread power outages.

Under these situations, it is important that critical infrastructure have backup electrical generating systems in order to maintain critical functions and services. At times, transportation systems, especially the highway network has been impacted by extreme heat events. Concrete pavements have experienced “blowouts or heaves” both on local highway and the higher volume parkway and interstate systems. Blowouts occur when pavements expand and cannot function properly within their allotted spaces. Pavement sections may rise up several inches during such events. These conditions can cause motor vehicle accidents in their initial stages and can shut down traffic lanes or roadways entirely until such times as the conditions are mitigated.

Economic Impact

HAZUS-MH does not provide an analysis of the economic impact to the study area as a result of extreme heat. Data for an analysis for the study area is not locally available.

Addressing Repetitive Loss Properties (NFIP data for floods, other hazards as available)

The National Flood Insurance Program provides information on payments to homeowners resulting from losses due to flooding. Under the extreme heat hazard event category, repetitive loss properties are not analyzed.

Estimating Potential Losses

HAZUS-MH does not provide an analysis of structural vulnerability to building stock, critical facilities or infrastructure. Extreme heat may impact buildings by placing increased strain on mechanical systems providing air conditioning and electrical power. Potential loss data is not available locally.

Analyzing Development Trends (new buildings, critical facilities and Infrastructure)

Section 4 of this plan Municipal Profile – Future Development identifies several areas in the City of White Plains where the potential for development or redevelopment exists. Structures, critical facilities and infrastructure would not be severely impacted by extreme heat. Extreme heat has been known to lead to other problems such as power failures. Critical facilities should have provisions for onsite power generation with automatic switching capabilities should a power outage occur. Landscaped areas may suffer due to a decrease in the availability of water from prolonged extreme heat conditions. Landscape designs which have the ability to retain water utilizing ponds, rain gardens and other absorbing features would prove beneficial in the event of a drought.

Additional Data and Next Steps

The Cooperative Institute for Research in the Atmosphere, located at Colorado State University in Fort Collins Colorado suggests that the total impacts of temperature extremes are not fully documented and known. Much of the documentation of temperature impacts combines other meteorological events and uses climatological scales of space and time. The nature of seasonal impacts is more cumulative and complex than the impacts of heat waves. Yet the impacts are measurable. Weather forecasting must take into account the hazards and impacts of temperature extremes to provide useful, understandable and timely information to reduce the impacts of extreme heat events.

Overall Vulnerability Conclusion

Based on information provided by NOAA-NCDC, local summer weather records and the experience of the HMPC, Extreme Heat has been determined to be a frequent event in the study area and thus a medium risk event.

Hazard Profile - Drought

Description

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over an extended time period, and it is often not obvious or easy to quantify when a drought begins and ends. Drought is a complex issue involving many factors. It occurs when a normal amount of moisture is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects:

- **Meteorological** drought is usually defined by a period of below average water supply.
- **Agricultural** drought occurs when there is an inadequate water supply to meet the needs of the state's crops and other agricultural operations such as livestock.
- **Hydrological** drought is defined as deficiencies in surface and subsurface water supplies. It is generally measured as stream flow, snowpack, and as lake, reservoir, and groundwater levels.
- **Socioeconomic** drought occurs when a drought impacts health, well-being, and quality of life or when a drought starts to have an adverse economic impact on a region.

Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere, or for water users that have a different water supply. Individual water suppliers may use criteria, such as rainfall/runoff, amount of water in storage, to define their water supply conditions. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline. The City of White Plains water comes from two City reservoirs, municipal wells, and the Kensico Reservoir which is part of the New York City water supply system.

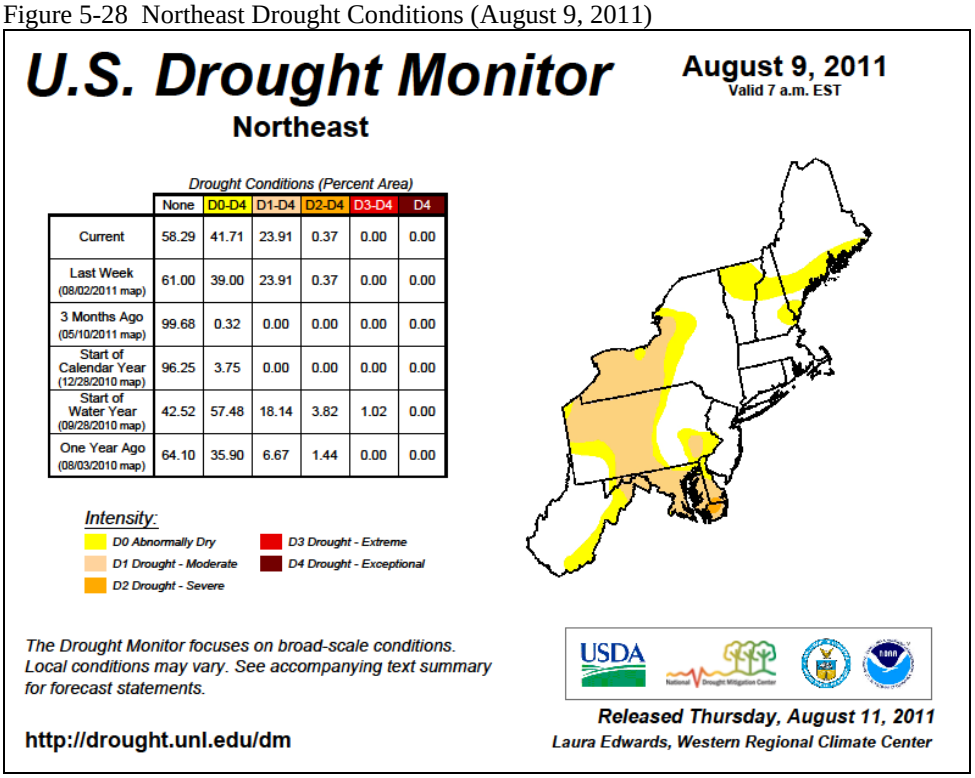
Location and Extent

The entire study area is susceptible to drought. Previous droughts in the study area have been both meteorological and hydrological. Several factors in a variety of combinations contribute to a drought condition including duration (lack of rainfall or mild winter as contributing factors), location as well as demand based on human activity and landscape. While the study area has experienced drought in the past, the consequences have in general been limited to lawn watering and vehicle washing restrictions. The New York City Water Supply System provides information on a daily basis as to the status of its water supply system. On December 6, 2011, the system stood at 94% of capacity while the average

capacity for this time of year is 72%. The New York City Department of Environmental Protection provides a means for persons with internet access to receive water supply system updates by e-mail.

Figure 5-28 below is updated regularly and shows drought conditions across the northeast United States.

Figure 5-28 Northeast Drought Conditions (August 9, 2011)



Previous Occurrences

The New York City Water Supply System has experienced 7 periods of drought in the last 46 years. Table 5-52 below illustrates these drought periods as the water supply system status.

Table 5-52 Drought History (New York City Water Supply System)

Year(s)	Item	Start	End
1963 – 1965	Conservation	11/1/1963	5/1/1964
	Intense Campaign	4/1/1965	
1980 – 1982	Watch	10/16/1080	
	Warning	11/6/1980	
	Emergency (Stage 1)	1/19/1981	
	Emergency (Stage 2)	4/1/1981	
	Modified	5/27/1981	
	Warning	1/18/1982	
	Watch	11/30/1982	
1985	Watch	2/25/1985	
	Warning	4/3/1985	
	Emergency (Stage 1)	4/26/1985	
	Emergency (Stage 2)	6/5/1985	
	Emergency (Stage 3)	7/10/1985	
	Normal	2/25/1986	
1989	Watch	1/17/1989	
	Emergency (Stage 2)	3/22/1989	
	Emergency (Stage 3)	5/1/1989	
	Normal	5/15/1989	
1991	Watch	9/25/1991	
	Warning	11/8/1991	
1995	Watch	7/5/1995	
	Warning	9/13/1995	11/14/1995
2002	Watch	12/23/2001	
	Warning	1/27/2002	
	Emergency (Stage1)	4/1/2002	
	Watch	11/1/2002	1/3/2003

Source: NYCDEP website

While the water supply for the study area is owned and operated by the NYCDEP, the New York State Department of Environmental Conservation has been designated to implement, monitor, prepare and plan for future droughts. Information concerning drought preparedness can be found on both the New York State Department of Environmental Conservation and New York City Department of Environmental Protection websites.

Probability of Future Events

Based on previous history, the study area is likely to experience droughts in the future. Based on historical records, the probability of a drought impacting the study area is occasional, (likely to be less than once every 5 years, but more than once every 30 years).

Vulnerability Assessment

The entire study area may be impacted due to drought. At risk areas might include open space where ground cover might die often making the area susceptible to erosion when the rains do return. Forested areas would have a higher exposure to fire during periods of drought. Water supply resources would be reduced during extended drought periods. Segments of the population would be at heightened risk because of advanced age or health related conditions.

Overview of vulnerability

While several droughts have occurred in the past, impacts have been limited for the most part to use restrictions such as lawn watering and car washing. The study area has limited agriculture use of its open land areas. When droughts have occurred, an effective public education effort is instituted until the emergency passes. The potential for warming associated with changes in the global climate is being evaluated and conditions may increase the potential for droughts in the future.

Data and methodology used in the evaluation

Data with respect to past drought events was provided by the New York City Department of Environmental Protection which operates and maintains the system which supplies water to the study area. Additional resources were reviewed including NOAA, FEMA and the Westchester County Drought Emergency Response Plan and the National Drought Monitoring Center at the University of Nebraska-Lincoln.

Impact on life, safety and health

Drought by itself has had minimal or no impact on life, safety and health related issues in the study area. Where droughts have been associated with extreme heat events, the potential for life, safety and health issues increases dramatically, especially for the elderly. Extreme heat hazard events are addressed elsewhere in this plan. When droughts have occurred, an effective educational effort is implemented to assist residents and businesses to conserve water.

Identifying structures including general building stock, critical facilities and critical infrastructure

Drought conditions by itself are not anticipated to impact general building stock, critical facilities and infrastructure.

Economic Impact

HAZUS-MH does not provide an analysis of the economic impact to the study area as a result of a drought. Economic impacts of drought are closely associated with agricultural, livestock, timber and fishery production, none of which exist in the study area.

Addressing Repetitive Loss Properties (NFIP data for floods, other hazards as available)

The National Flood Insurance Program provides information on payments to homeowners resulting from losses due to flooding. Under the drought hazard event category, repetitive loss properties are not analyzed.

Estimating Potential Losses

HAZUS-MH does not provide an analysis of structural vulnerability to building stock, critical facilities or infrastructure. Drought may impact buildings by increasing the weathering to outside surfaces and placing increased strain on mechanical systems providing air conditioning when high temperatures are associated with a drought. Potential loss data is not available locally.

Analyzing Development Trends (new buildings, critical facilities and Infrastructure)

Section 4 of this plan Municipal Profile – Future Development identifies several areas in the City of White Plains where the potential for development or redevelopment exists. Structures, critical facilities and infrastructure would not be severely impacted by drought. Landscaped areas may suffer due to a decrease in the availability of water. Landscape designs which have the ability to retain water utilizing ponds, rain gardens and other absorbing features would prove beneficial in the event of a drought.

Additional Data and Next Steps

Data available from Federal, State and local resources indicates that drought in general has not had a significant impact on the study area. Over time, this may change as a result of changes in climate in recent and in future years. The New York State Department of Environmental Conservation, New York City Department of Environmental Protection and County of Westchester all have plans as well as educational efforts in place should the potential for a drought arise.

Overall vulnerability conclusion

Drought has been determined to be an occasional event in the study area and thus a low risk event.

Hazard Profile – Earthquake

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a Richter magnitude and is measured directly from the earthquake as recorded on seismographs. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface as felt by humans and defined in the Modified Mercalli scale (see Table 5-54). Seismic shaking is typically the greatest cause of losses to structures during earthquake. The following databases were searched for information on the potential for earthquakes to impact the study area:

- HAZUS-MH and Associated Guidance
- New York City Area Consortium for Earthquake Loss Mitigation (NYCEM) http://www.nycem.org/default.asp
- United States Geological Survey (USGS), http://www.usgs.gov
- New York State 2008 Hazard Mitigation Plan, http://www.dhses.ny.gov/oem/miytigation/plan.cfm
- Albany Times Union Newspaper http://www.timesunion.com
- Laredo, Texas Morning Times http://www.lmtonline.com
- Lamont-Doherty Observatory, Columbia University, New York http://www.ldeo.columbia.edu

Table 5-53 Earthquake Definitions

Term	Definition
Earthquake	Both sudden slip on a fault, and the resulting ground shaking and radiated seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth.
Earthquake Hazard	Anything associated with an earthquake that may affect the normal activities of people. This includes surface faulting, ground shaking, landslides, liquefaction, tectonic deformation, tsunamis, and seiches.
Earthquake Risk	The probable building damage, and number of people that are expected to be hurt or killed if a likely earthquake on a particular fault occurs.
Magnitude	A number that characterizes the relative size of an earthquake. Magnitude is based on measurement of the maximum motion recorded by a seismograph.
Velocity	How fast a point on the ground is shaking as a result of an earthquake.
Intensity	A number (written as a Roman numeral) describing the severity of an earthquake in terms of its effects on the earth's surface and on humans and their structures.
Acceleration	Change from one speed, or velocity, to another is called acceleration.
Peak Acceleration	The largest acceleration recorded by a particular station during an earthquake.
Seismic Waves	Vibrations that travel outward from the earthquake fault at speeds of several miles per second. Although fault slippage directly under a structure can cause considerable damage, the vibrations of seismic waves cause most of the destruction during earthquakes.
Aftershocks	Earthquakes that follow the largest shock of an earthquake sequence. They are smaller than the main shock and within 1-2 fault lengths distance from the main shock fault. Aftershocks can continue over a period of weeks, months, or years. In general, the larger the main shock, the larger and more numerous the

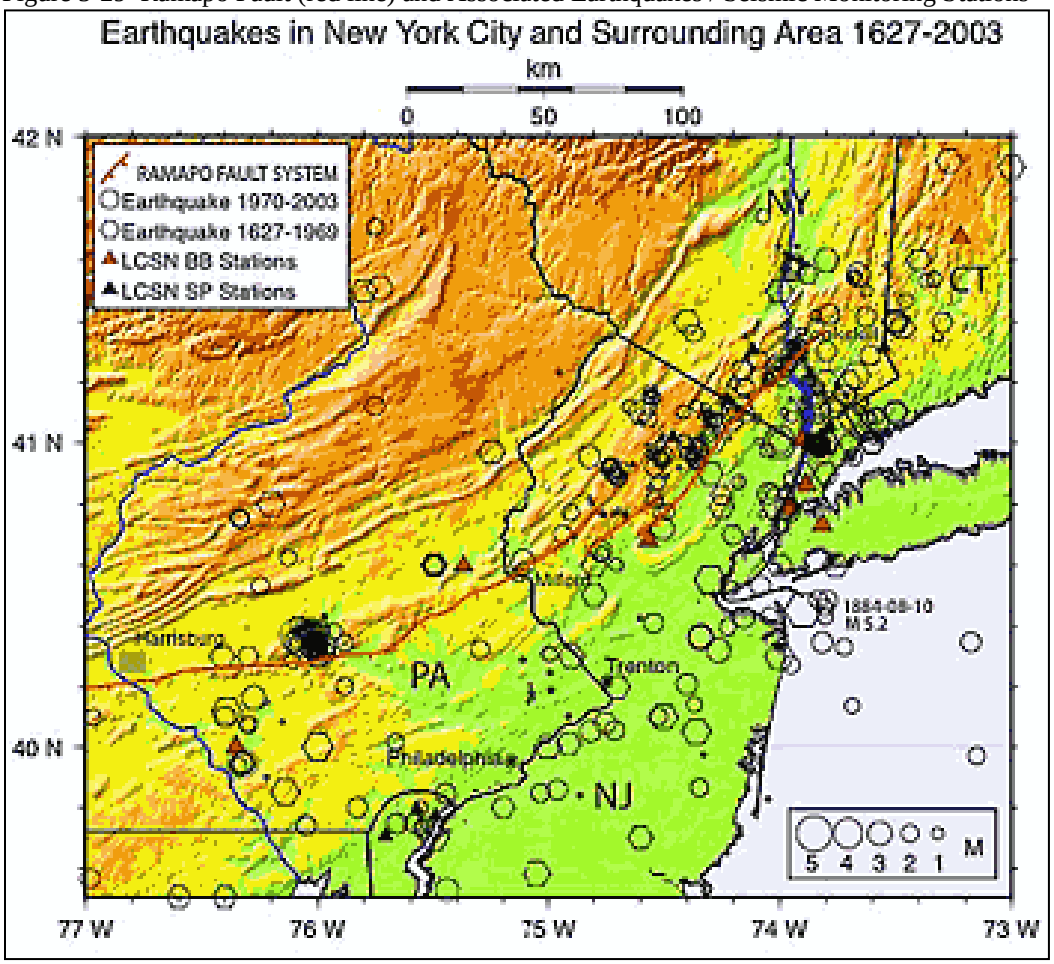
	aftershocks, and the longer they will continue.
Epicenter	The point on the earth's surface vertically above the hypocenter (or focus), point in the crust where a seismic rupture begins.
Hypocenter	The location beneath the earth's surface where the rupture of the fault begins.
Fault	A fracture along which the blocks of crust on either side being moved relative to one another parallel to the fracture.
For more in-depth definitions regarding Earthquake terminology please reference the U.S. Geological Survey website at www.usgs.gov.	

Source: NYSHMP/USGS

Geographic Location and Extent

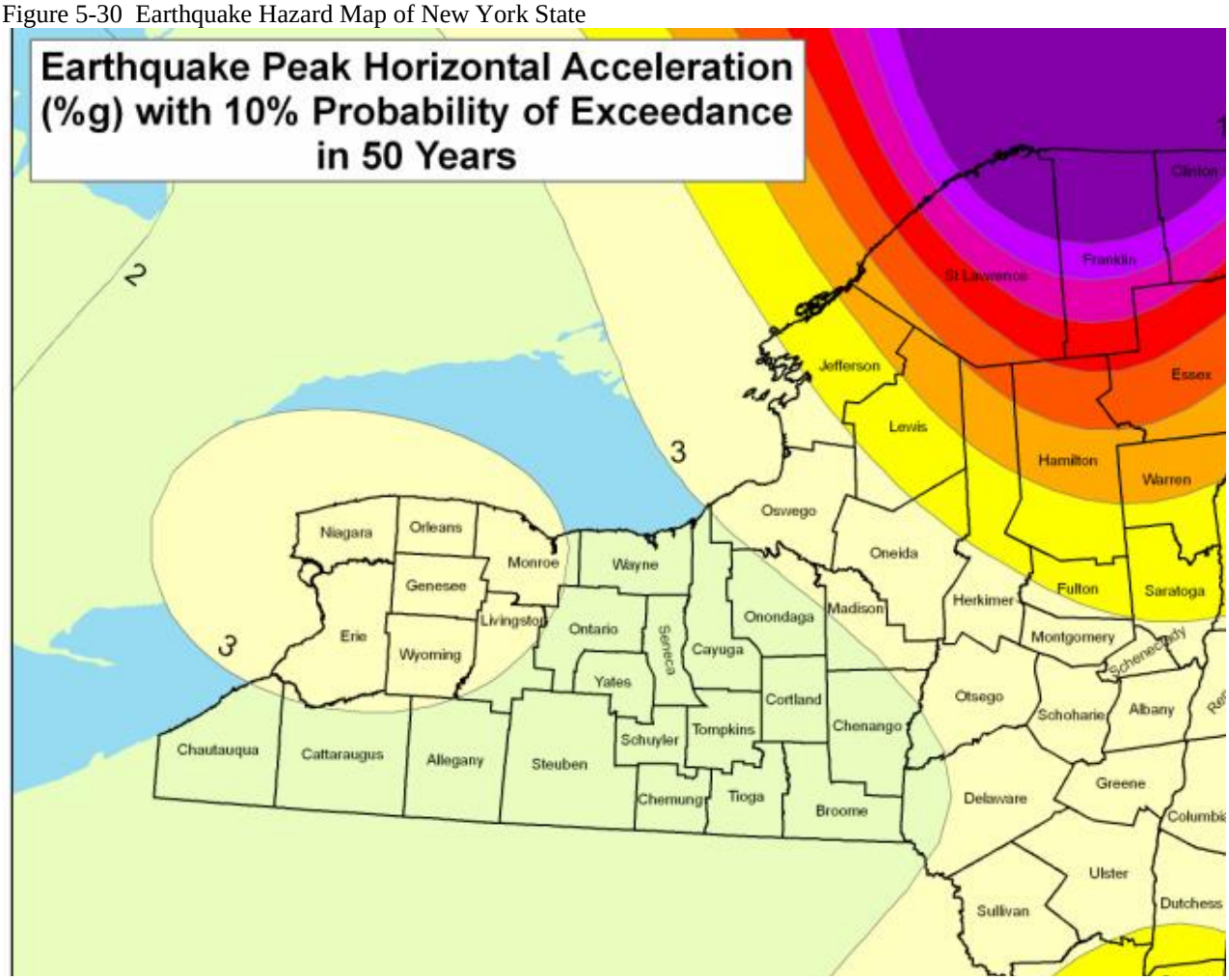
There are no documented faults within the study area. The study area is however, in close proximity to several fault lines including those located in New York City. The Ramapo Fault runs from Southeastern New York into eastern Pennsylvania. This fault line is of considerable interest due to its close proximity to the Indian Point Nuclear Power Plant in Buchanan, New York. Indian Point is approximately 17.5 miles from the study area at its closest point. The study area has experienced shaking as a result of earthquake activity, the most recent occurring on August 23, 2011 from an earthquake measuring 5.8 on the Richter Scale and located near Mineral, Virginia.

Figure 5-29 Ramapo Fault (red line) and Associated Earthquakes / Seismic Monitoring Stations



Source: http://www.ldeo.columbia.edu

Figure 5-30 Earthquake Hazard Map of New York State



Source: NYS Multi-Hazard Mitigation Plan 2008

Severity of an earthquake is a function of the amount of energy released and is expressed by its magnitude and intensity. Table 5-54 below combine the Richter and Mercalli Scales in order to present a clear picture as to the relationship of these scales.

Table 5-54 Richter Scale and Modified Mercalli Scale

Modified Mercalli Intensity	Description	Richter Magnitude
I	Instrumental: detected only by seismographs	3.5
II	Feeble: noticed only by sensitive people	4.2
III	Slight: like the vibrations due to a passing train; felt by people at rest, especially on upper floors	4.3
IV	Moderate: felt by people while walking, rocking of loose objects, including standing houses	4.8
V	Rather strong: felt generally, most sleepers are awakened and bells ring	4.8-5.4
VI	Strong: trees sway and all suspended objects swing; damage by overturning and falling loose objects	5.5-6.0
VII	Very strong: general alarm; walls crack, plaster falls	6.1
VIII	Destructive: car drivers seriously disturbed; masonry fissures; chimneys fall; poorly constructed buildings damaged	6.2
IX	Ruinous: some houses collapse where ground begins to crack, and pipes break open	6.9
X	Disastrous: ground cracks badly; many buildings destroyed and railway lines bend; landslides on steep slopes	7.0-7.03
XI	Very disastrous: few buildings remain standing; bridges destroyed; all services (transportation and utility) affected; landslides and floods	7.4-8.1
XII	Catastrophic: total destruction; objects thrown into the air, ground rises and falls in waves	>8.1

Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, communication, and transportation lines. Other damage-causing effects of earthquakes include surface rupture, fissuring, settlement, and permanent horizontal and vertical shifting of the ground. Secondary impacts can include landslides, soils liquefaction, fires, and dam failure.

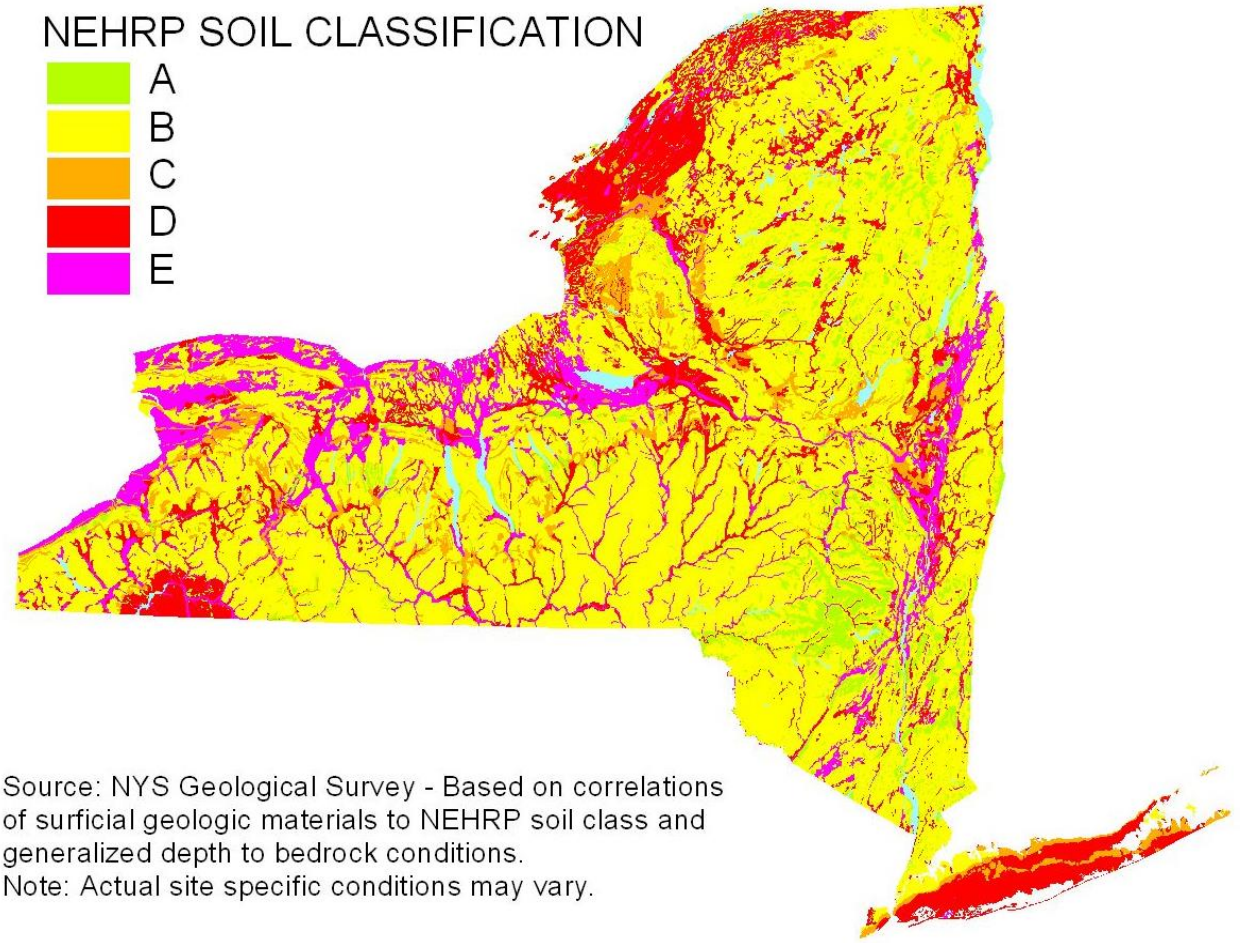
Besides magnitude and intensity of an earthquake, the other factor which can have an impact on damage is the local soil type. The National Earthquake Hazard Reduction Program (NEHRP) lists five soil classifications which can have an impact on the severity of an earthquake. Table 5-55 outlines these soil classifications and Figure 5-31 illustrates them. Westchester County which includes the City of White Plains includes in the majority class B, C, and D soils.

Table 5-55 Soil Classification Descriptions

Soil Classification	Description	Map Color
A	Very hard rock (e.g. granite, gneiss)	Green
B	Sedimentary rock or firm ground	Yellow
C	Stiff Clay	Orange
D	Soft to mediums clays or sands	Red
E	Soil including fill, loose sand, waterfront, lake bed clays	Pink

Source: NYS Hazard Mitigation Plan

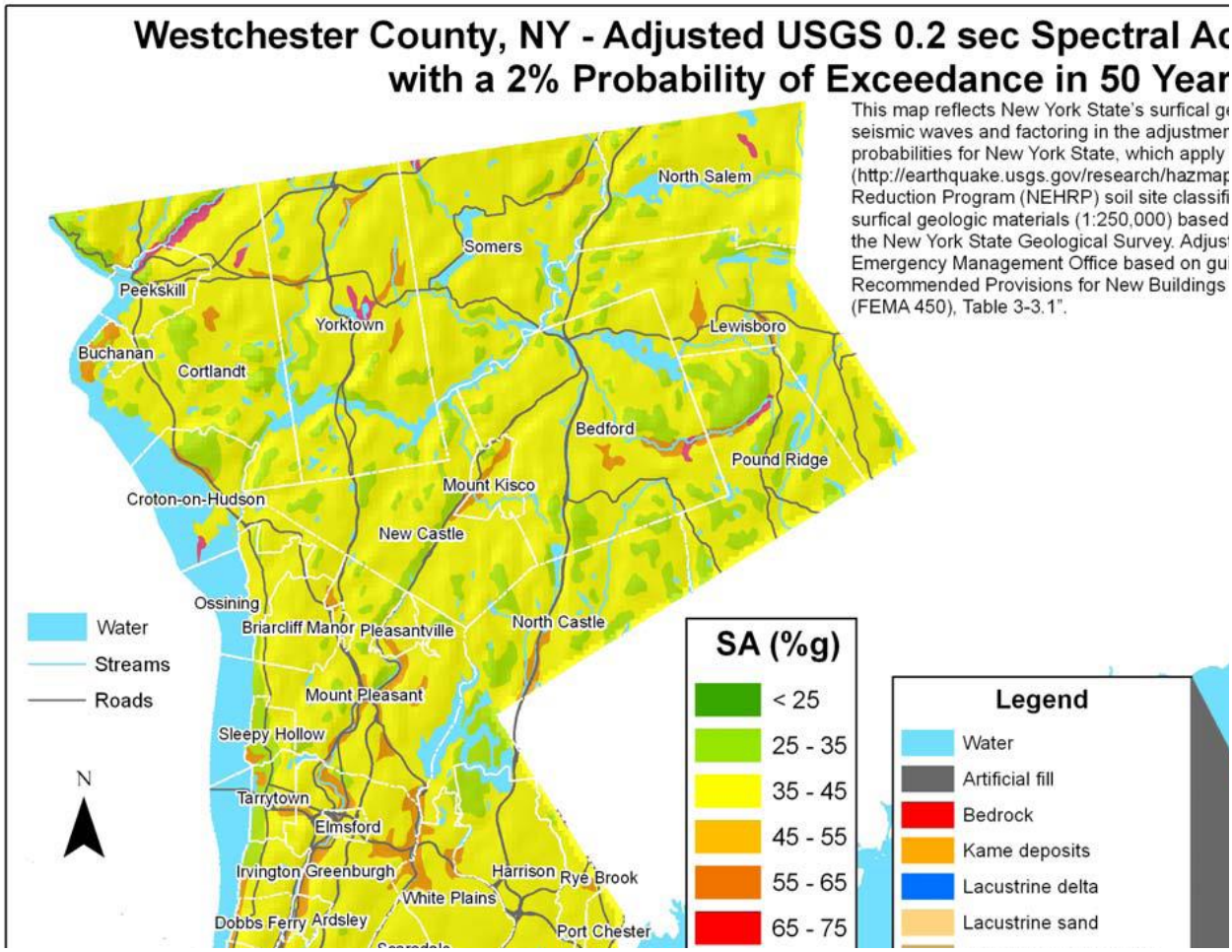
Figure 5-31 Soil Classification Map for New York State



Source: NYS Multi-Hazard Mitigation Plan 2008

This classification of the State's surfical geologic materials by NEHRP soil site class has enabled the effect of soils to be factored with the USGS seismic hazard maps to give an adjusted, more regionally refined picture, of the State's earthquake hazard based. The level of adjustment to USGS map is based on use of the NHERP's soil site coefficients for each soil class, which varies according to the USGS mapped accelerations. The reference for the appropriate coefficient is found in "The 2003 NEHRP Recommended Provisions for New Building and Other Structures – Part: Provisions (FEMA 450)". These coefficients provide the level of increase or decrease to the USGS's seismic hazard map spectral accelerations.

Figure 5-32 Adjusted USGS 0.2 sec Spectral Acceleration (SA) with a 2% Probability of Exceedance in 50 Years

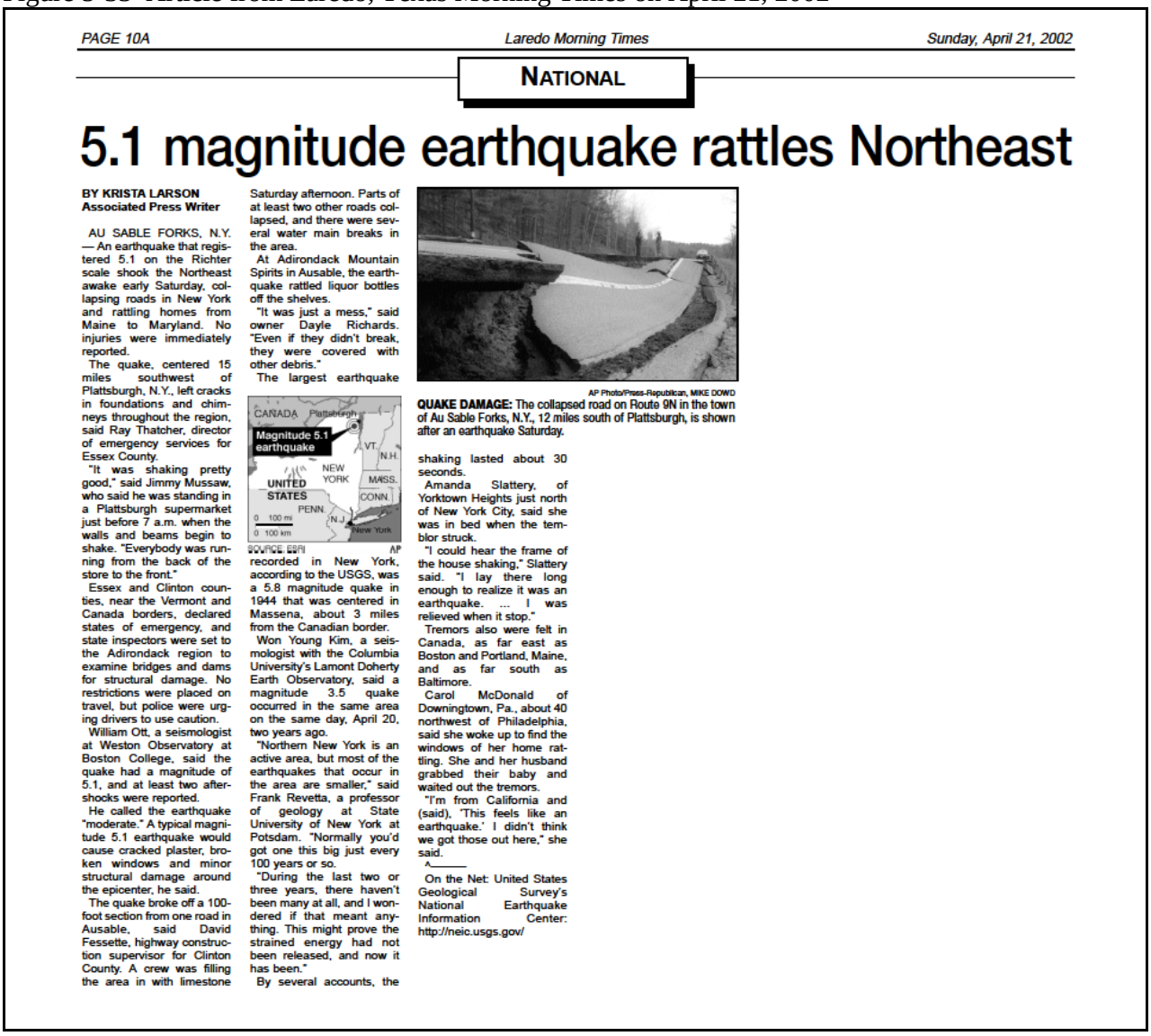


Source: NYS Multi-Hazard Mitigation Plan 2008

Previous Occurrences and Losses

While Westchester County and the study area in particular lie within one of three areas of New York State with a higher risk of experiencing an earthquake event (see Figure 5-30), reports of earthquakes of magnitudes which would be noticeable are rare. The most recent and noticeable earthquake to be felt in the study area had its epicenter near Mineral, Virginia on August 23, 2011 and measured 5.8 on the Richter Scale. Table 5-56 documents earthquakes having occurred near the study area between 1737 and 2011. Discussions with Department of Public Works staff as well as members of the HMPC found that no records existed with respect to any damage to public infrastructure associated with earthquakes felt in the study area from a magnitude 4.0 event occurring on October 19, 1985 near Ardsley, New York, the April 20, 2002 2.1 magnitude earthquake which occurred near Au Sable Forks in Essex County, New York or the August 23, 2011 5.8 earthquake near Mineral, Virginia. The April 20, 2002 earthquake received national attention including the article in the Laredo, Texas Morning Times Shown in Figure 5-33.

Figure 5-33 Article from Laredo, Texas Morning Times on April 21, 2002



PAGE 10A Laredo Morning Times Sunday, April 21, 2002

NATIONAL

5.1 magnitude earthquake rattles Northeast

BY KRISTA LARSON
Associated Press Writer

AU SABLE FORKS, N.Y. — An earthquake that registered 5.1 on the Richter scale shook the Northeast awake early Saturday, collapsing roads in New York and rattling homes from Maine to Maryland. No injuries were immediately reported.

The quake, centered 15 miles southwest of Plattsburgh, N.Y., left cracks in foundations and chimneys throughout the region, said Ray Thatcher, director of emergency services for Essex County.

"It was shaking pretty good," said Jimmy Mussaw, who said he was standing in a Plattsburgh supermarket just before 7 a.m. when the walls and beams begin to shake. "Everybody was running from the back of the store to the front."

Essex and Clinton counties, near the Vermont and Canada borders, declared states of emergency, and state inspectors were set to the Adirondack region to examine bridges and dams for structural damage. No restrictions were placed on travel, but police were urging drivers to use caution.

William Ott, a seismologist at Weston Observatory at Boston College, said the quake had a magnitude of 5.1, and at least two aftershocks were reported.

He called the earthquake "moderate." A typical magnitude 5.1 earthquake would cause cracked plaster, broken windows and minor structural damage around the epicenter, he said.

The quake broke off a 100-foot section from one road in Ausable, said David Fessette, highway construction supervisor for Clinton County. A crew was filling the area in with limestone Saturday afternoon. Parts of at least two other roads collapsed, and there were several water main breaks in the area.

At Adirondack Mountain Spirits in Ausable, the earthquake rattled liquor bottles off the shelves.

"It was just a mess," said owner Dayle Richards. "Even if they didn't break, they were covered with other debris."

The largest earthquake

SOURCE ESRI AP

recorded in New York, according to the USGS, was a 5.8 magnitude quake in 1944 that was centered in Massena, about 3 miles from the Canadian border.

Won Young Kim, a seismologist with the Columbia University's Lamont Doherty Earth Observatory, said a magnitude 3.5 quake occurred in the same area on the same day, April 20, two years ago.

"Northern New York is an active area, but most of the earthquakes that occur in the area are smaller," said Frank Revetta, a professor of geology at State University of New York at Potsdam. "Normally you'd got one this big just every 100 years or so.

"During the last two or three years, there haven't been many at all, and I wondered if that meant anything. This might prove the strained energy had not been released, and now it has been."

By several accounts, the

AP Photo/Press-Republican, MIKE DOWD

QUAKE DAMAGE: The collapsed road on Route 9N in the town of Au Sable Forks, N.Y., 12 miles south of Plattsburgh, is shown after an earthquake Saturday.

shaking lasted about 30 seconds.

Amanda Slattery, of Yorktown Heights just north of New York City, said she was in bed when the temblor struck.

"I could hear the frame of the house shaking," Slattery said. "I lay there long enough to realize it was an earthquake. ... I was relieved when it stop."

Tremors also were felt in Canada, as far east as Boston and Portland, Maine, and as far south as Baltimore.

Carol McDonald of Downingtown, Pa., about 40 northwest of Philadelphia, said she woke up to find the windows of her home rattling. She and her husband grabbed their baby and waited out the tremors.

"I'm from California and (said), 'This feels like an earthquake.' I didn't think we got those out here," she said.

^_____

On the Net: United States Geological Survey's National Earthquake Information Center: http://neic.usgs.gov/

Source: Laredo, Texas Morning Times

The Albany Times Union Newspaper, in an article dated April 21, 2000 and titled "Adirondack Area Gets A Bit Of A Jolt" reported other earthquakes in New York State in recent times occurring on April 20, 2000 at 4:47 AM centered near Newcomb, Essex County, New York and measuring 3.7 on the Richter Scale; on October 7, 1983 in the same general area which was felt in 12 states and 2 Canadian Provinces and measured 5.1 on the Richter Scale and the largest ever occurring in the State of New York on September 5, 1944 near Messina, New York and measuring 5.8 on the Richter Scale. The September 5, 1944 earthquake caused $2 million in damage in 1944 dollars in a sparsely populated area. The same event in 2000 could be expected to cause $15 to $20 million in damages.

Table 5-56 Largest Earthquakes in New York City Area (1737-2001)

Date	Location	Magnitude Richter	Max. Intensity	Remarks
December 19, 1737	Greater NY City Area	5.2	VII	Threw down chimneys
November 30, 1783	N Central NJ	4.9	VI	Threw down chimneys
October 26, 1845	Greater NY City Area	3.8	VI	NA
1847	Greater NY City Area	4.5	V	Many people in NY city area felt the earthquake
September 9, 1848	Greater NY City Area	4.4	V	Felt by population
December 11, 1874	Near Nyack and Tarrytown, NY	3.4	VI	NA
August 10, 1884	Greater NY City Area	5.2	VII	Threw down chimneys, felt from Maine to Virginia
January 4, 1885	Hudson Valley	3.4	VI	NA
September 1, 1895	N Central NJ	4.3	VI	Location determined by fire and aftershock
June 1, 1927	Near Asbury Park, New Jersey	3.9	VI-VII	Very high intensity in Asbury Park, NJ, perhaps shallow event
July 19, 1937	Western Long Island, NY	3.5	IV	One of few earthquakes beneath Long Island
August 23, 1938	Central NJ	3.8	VI	NA
September 3, 1951	Rockland County, NY	3.6	V	NA
March 23, 1957	Central NJ	3.5	VI	NA
March 10, 1979	Central NJ	3.2	V-VI	Felt by some people in Manhattan
October 19, 1985	Ardsley, NY	4.0	IV	Many people in the NY City area felt this earthquake
January 17, 2001	Manhattan, NY City	2.4	IV	Felt in upper East Side of Manhattan, Long Island and Queens, NYC
October 27, 2001	Manhattan, NY City	2.6	IV	Felt in upper West Side of Manhattan, Astoria and Queens, NYC

Source: http://www.ldeo.columbia.edu/LCSN/big-ny-eq.html

While a number of resources were researched for earthquake data for the study area, including the United States Geological Survey, the 2008 New York State Hazard Mitigation Plan, and then Lamont-Doherty Earth Observatory of Columbia University, data was not consistent throughout all the resources utilized. The data provided by Lamont-Doherty was utilized herein because of its close proximity to the study area. Of the 18 earthquakes documented in Table 5-56, two are indicated to have occurred near the study area. The earthquake of December 11, 1874, with a magnitude of 3.4, was located near Tarrytown and Nyack, New York, less than 5 miles from the study area. The earthquake of October 19, 1985, with a magnitude of 4.0, originated near Ardsley, New York, also less than 5 miles from the study area.

Probability of Future Events

The NYSHMP notes that New York State can expect a damaging earthquake about once every 22 years, and these events are more likely to occur within one of the three regional areas identified previously. Westchester County and the City of White Plains are included in the southernmost of these three regions. The State Plan references a NYSGS study by W. Mitrovonas, entitled "Earthquake Hazard in New York State," which states, "…at present an earthquake of magnitude 3.5 to 4 occurs, on the average every three years somewhere in the State. Such earthquakes do not cause any appreciable damage (except for cracks in plaster, perhaps) but large enough to be felt strongly by many people near the epicenter."

In the beginning of this plan, the hazards most likely to impact the study were identified by the HMPC, discussed as to their impact on the study area, and ranked as to the possibility of an event occurrence. Based on historical records and input from the HMPC, the probability of occurrence for earthquakes in the City of White Plains is considered occasional (likely to occur less often than once every 5 years, but more often than once every 30 years). While there are no records of damages associated with past earthquake events, future events could affect building stock, critical facilities and infrastructure and the local economy given a severe enough event. There is also a potential for secondary events as a result of an earthquake including fires, utility failures and flooding.

Vulnerability Assessment

A vulnerability assessment is defined as assessing the vulnerability of people and the built environment to a given level of hazard. After identifying types of risk, a vulnerability analysis can help to determine the weak points in the community. This assessment examines the vulnerability of the existing and future built environment, such as structures, utilities, roads and bridges, as well as environmental vulnerability, such as open space that can suffer from erosion. Once the geographic areas of risk are identified in the City of White Plains, vulnerability can be assessed for the population, property and resources at risk in those areas. Vulnerability indicates what is likely to be damaged by the identified hazards and how severe the damage may be. For example, if an area is determined to be at risk of an earthquake, vulnerability estimates for that area could include residential property losses, impacts to the tax base and damages to public infrastructure. Earthquake events can impact the entire City of White Plains. All assets including population, structures, critical facilities and utilities are vulnerably. The following sections evaluate and estimate the potential impact of severe storms:

- Overview of vulnerability
- Data and methodology used in the evaluation
- Impact on life, safety and health
- Identifying structures including general building stock, critical facilities and critical infrastructure
- Economic impact
- Addressing Repetitive Loss Properties (NFIP data for floods, other hazards as available)
- Estimating Potential Losses
- Analyzing Development Trends (new buildings, critical facilities, and infrastructure)
- Additional Data and Next Steps
- Overall vulnerability conclusion
- Multi-jurisdictional Risk Assessment

Overview of Vulnerability

Earthquake vulnerability is primarily based upon population and the built environment. Urban areas in high hazard zones are the most vulnerable, while uninhabited areas are less vulnerable. The ability to accurately estimate the timing, location, and severity of future earthquake activity in the City of White Plains is limited due to lack of good historical data and the relative infrequent occurrence of earthquakes which generate damage. Ground shaking, the principal cause of damage, is the major earthquake hazard. Many factors affect the potential damageability of structures and systems from earthquake-caused ground motions. Some of these factors include proximity to the fault, direction of the rupture, epicentral location and depth, magnitude, local geologic and soil conditions, types and quality of construction, building configurations and heights, and comparable factors that relate to utility, transportation, and other network systems. Ground motions become structurally damaging when average peak accelerations reach 10 to 15 percent of gravity, and when the Modified Mercalli Intensity Scale is about VII (18-34 percent peak ground acceleration), which is considered to be very strong (general alarm; walls crack; plaster falls).

In general, newer construction is more earthquake resistant than older construction because of improved building codes and their enforcement. Manufactured housing is very susceptible to damage because rarely are their foundation systems braced for earthquake motions. Locally generated earthquake motions, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of un-reinforced masonry. Common impacts from earthquakes include damage to infrastructure and buildings (e.g., crumbling of un-reinforced masonry [brick], failure of architectural facades, rupturing of underground utilities, gas-fed fires, landslides and rock falls, and road closures). Earthquakes can also trigger secondary effects, such as dam failures, explosions, and fires that become disasters themselves.

Data and Methodology

HAZUS-MH was utilized to model earthquake losses for the City of White Plains. Inventory and risk are from scenarios performed in FEMA's HAZUS software. Scenarios were run to assess potential economic and social losses due to earthquake activity. As previously stated, local historical information is minimal at best and consists principally of institutional knowledge of long tenured municipal staff, comments from the HMPC and public comments.

Assessments were conducted for two Mean Return Periods of 100 and, 500 years which created a range of potential loss estimates. A 100 year Mean Return Period (MRP) indicates that there is a 1% chance that the determined ground motion levels or Peak Ground Acceleration (PGA) will be exceeded in any given year. A 500 year MRP creates a 0.2% chance that a determined PGA will be exceeded in any given year. For our purposes, **HAZUS-MH utilized an Earthquake Magnitude of 7.0 in analyzing potential events. A 4.8-5.4 magnitude event is the point at which people may begin to be awakened and objects begin to fall from shelves.**

The 2008 New York State Mitigation Plan's annualized earthquake loss analysis was based on HAZUS model's default soil classification – the National Earthquake Hazard Reduction Program's (NEHRP) soil class "D". This was applied across the entire state. The "D" soil class is next to the worst soil class in terms of ground shaking amplification. Although there are many areas of the state that have been classified with soil class "D" and even worse class "E" in this most recent study, there was overall a better (less amplification) soil class assigned resulting in a significant loss reduction. This demonstrates

the significance of soil factors in earthquake risk assessment. For purposes of this study, the class "D" soil will be utilized in all analysis.

Impact on Life, Health and Safety

Impact on life, health and safety combines several factors including the severity of the event as well as one's location and time when the event occurs (e.g. inside a building, adjacent to a building, in open space, driving, etc). Based on past history, risk to life, health and safety is minimal. Should an earthquake of sufficient magnitude occur, residents may be displaced and require sheltering or need to seek refuge with relatives and friends outside the earthquake impact area. Low income and senior citizens are particularly susceptible because of their financial or physical condition. According to the 2010 Census, 15.3% of the study area population is over 65. There are 6 manufactured type homes in the study area. HAZUS-MH was utilized to develop sheltering and casualty information.

Table 5-57 Sheltering Requirements

Category	100 Year Event	500 Year Event
Households displaced	0	25
Persons seeking temporary shelter	0	16

Source: HAZUS-MH

HAZUS-MH estimates for casualties are provided for three times of day; (2:00 AM, 2:00 PM and 5:00 PM). These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residency occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and the 5:00 PM represents peak commute time. Table 5-58 provides these estimates. Casualty levels are defined with severities as follows:

- Level 1: Injuries require medical attention but hospitalization is not needed
- Level 2: Injuries will require hospitalization but are not considered life threatening
- Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated
- Level 4: Victims are killed by the earthquake

Table 5-58 Casualty Estimates (number of persons)

Time	Sector	100 Year Level 1	100 Year Level 2	100 Year Level 3	100 Year Level 4	500 Year Level 1	500 Year Level 2	500 Year Level 3	500 Year Level 4
2AM	Commercial	0	0	0	0	0	0	0	0
	Commuting	0	0	0	0	0	0	0	0
	Educational	0	0	0	0	0	0	0	0
	Hotels	0	0	0	0	0	0	0	0
	Industrial	0	0	0	0	0	0	0	0
	Other Residential	0	0	0	0	3	0	0	0
	Single Family	0	0	0	0	2	0	0	0
	Total	**0**	**0**	**0**	**0**	**5**	**1**	**0**	**0**
2PM	Commercial	0	0	0	0	6	1	0	0
	Commuting	0	0	0	0	0	0	0	0
	Educational	0	0	0	0	1	0	0	0
	Hotels	0	0	0	0	0	0	0	0

	Industrial	0	0	0	0	0	0	0	0
	Other Residential	0	0	0	0	1	0	0	0
	Single Family	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**8**	**1**	**0**	**0**
5PM	Commercial	0	0	0	0	4	0	0	0
	Commuting	0	0	0	0	0	0	0	0
	Educational	0	0	0	0	0	0	0	0
	Hotels	0	0	0	0	0	0	0	0
	Industrial	0	0	0	0	0	0	0	0
	Other Residential	0	0	0	0	1	0	0	0
	Single Family	0	0	0	0	1	0	0	0
	Total	**0**	**0**	**0**	**0**	**6**	**1**	**0**	**0**

Source: HAZUS-MH

Identifying Structures

According to the New York City Consortium for Earthquake Mitigation (NYCEM) most damage and loss to structures and infrastructure is the result of ground shaking. Ground motion and its relationship to gravity are the factors affecting an earthquake's impact on buildings and infrastructure. Data provided by modeling from HAZUS-MH were used to illustrate the earthquake hazard for general building stock in the study area. The following figures represent (PGA) for 100 and 500 year earthquake events.

Due to the wide ranging impact of an earthquake event, the entire study area is at risk and will be analyzed for structural damage and losses. HAZUS determines the value of the building stock and then assigns a loss value. The analysis considers the age of the building stock, occupancy class, construction composition, examples of structural damage, and building damage based on severity of an event.

Table 5-59 Building Stock Exposure by Occupancy Type

Building Occupancy Class	Number of Buildings	Exposure Value ($1,000)	Percent of Total Exposure Value
Agriculture	95	16,034	0.8
Commercial	1,415	1,919,291	11.6
Education	59	73,101	0.5
Government	80	92,462	0.7
Industrial	360	276,289	2.9
Residential	10,086	3,809,353	82.6
Religion	114	107,387	0.9
Total	**12,209**	**6,293,917**	**100%**

Source: HAZUS-MH

Buildings' construction composition is one factor which determines a building's survivability of an earthquake. Wood and steel constructed buildings are more likely to resist an earthquake shaking than unreinforced masonry structures which would tend to bow out and collapse during an event.

Table 5-60 Building Stock by Construction Type as a Percentage (%) of Study Area Total

Building Construction	Count	Percent of Total
Wood	8498	69.6
Steel	995	8.2
Concrete	297	2.4
Precast	69	0.6
Reinforced Masonry	343	2.8
Un-reinforced Masonry	2000	16.4
Manufactured Homes	6	0.0
Total	**12,209**	**100%**

Source: HAZUS-MH

HAZUS-MH maintains an inventory of Critical Facilities; essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations, emergency operations facilities and public works operations and maintenance facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazard material sites.

Table 5-61 Critical Facility Inventory

Group	Category	Number of Facilities in Study Area
Essential Facilities		
	Hospitals	3
	Medical Clinics	
	Schools	23
	Fire Stations	7
	Police Stations	1
	Emergency Operations	1
	Public Works Operations and Maintenance	2
High Potential Loss Facilities		
	Dams	4
	Levees	0
	Military Installations	0
	Nuclear Power Plans	0
	Hazard Materials Sites	0

Source: HAZUS-MH and municipal records

Transportation and Utility Lifeline Facilities are those infrastructures both public and privately owned that provide services which allow communities to function and be economically viable. The HAZUS-MH program maintains a local inventory of these facilities including transportation systems which include highways, railways, light rail, bus, ports, ferry and airports. Also included in the inventory are utility systems such as potable water, wastewater, natural gas, crude and refined oil, electric power and communications. The total value of the lifeline inventory exceeds $869 million and includes 56 kilometers of highways, 32 bridges, and 459 kilometers of pipes.

Table 5-62 Transportation System Lifeline Inventory

System	Component	No. of locations/segments	Replacement Value (millions of dollars)
Highway	Bridges	32	462.70
	Segments	82	395.80
	Tunnels	0	0.00
		Subtotal	*858.50*
Railways	Bridges	3	0.30
	Facilities	0	0.00
	Segments	4	8.00
	Tunnels	0	0.00
		Subtotal	*8.30*
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	*0.00*
Bus	Facilities	2	2.60
		Subtotal	*2.60*
Ferry	Facilities	0	0.00
		Subtotal	*0.00*
Port	Facilities	0	0.00
		Subtotal	*0.00*
Airport	Facilities	0	0.00
	Runways	0	0.00
		Subtotal	*0.00*
		Total	**869.40**

Source: HAZUS-MH

While all of these facilities exist in the study area, only a portion of the highway network is the operating and maintenance responsibility of the City of White Plains. Highway mileage in the study area is broken down as shown in Table 5-63.

Table 5-63 Municipal Entity Responsible for Transportation System Lifelines

Municipal Entity Responsible	Mileage
City of White Plains	112.0
New York State Department of Transportation	2.1
New York State Thruway Authority	3.7
County of Westchester	24.7

Source: New York State Department of Transportation Highway Inventory

The railway system is operated and maintained by the Metro-North Commuter Railroad and the Airport is operated and maintained by the County of Westchester.

Table 5-64 Utility System Lifeline Inventory

System	Component	No. of locations/segments	Replacement Value (millions of dollars)
Potable Water	Distribution Lines	NA	4.6
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	*4.60*
Waste Water	Distribution Lines	NA	2.80
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	*2.80*
Natural Gas	Distribution Lines	NA	1.80
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	*1.80*
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	*0.00*
Electric Power	Facilities	0	0.00
		Subtotal	*0.00*
Communication	Facilities	0	0.00
		Subtotal	*0.00*
		Total	**9.20**

Source: HAZUS-MH

In order to fully evaluate the potential for damage and loss based on occupancy class, severity of damage to each type of occupancy must also be considered. Table 5-65 provides definitions for damage categories to a light wood framed building.

Table 5-65 Example of Structural Damage by Category and Description for Light Wood Framed Buildings

Damage Category	Description
None	
Slight	Small plaster or gypsum board cracks at corners of door and window openings and wall/ceiling intersections; small cracks in masonry chimneys and masonry veneer.
Moderate	Large plaster or gypsum board cracks at corners of doors and window openings; small diagonal cracks across shear wall panels exhibited by small cracks in stucco and gypsum wall panels; large cracks in brick chimneys; toppling of tall masonry chimneys
Extensive	Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations; partial collapse of room-over-garage or other soft-story configurations
Complete	Structure may have large permanent lateral displacement, may collapse, or be in imminent danger of collapse due to cripple wall failure or the failure of the lateral load resisting system; some structures may slip and fall off the foundations; large foundation cracks.

Source: HAZUS-MH

Economic Impact

There is little local information available with respect to how an earthquake event may impact the study area economically since events are few and far in between and of a magnitude which creates the need to document economic impact. Damage which closes a commercial, industrial or business establishment or limits access to these type facilities will create a loss of sales tax in the municipality from goods and services provided. HAZUS-MH was utilized to estimate economic losses for buildings, critical facilities and transportation and lifeline systems. Building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during an earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of an earthquake.

Table 5-66 Building Related Economic Loss Estimates 100 Year MRP Event (Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses	Wage	0.00	0.00	0.00	0.00	0.00	0.00
	Capital-Related	0.00	0.00	0.00	0.00	0.00	0.00
	Rental	0.00	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Capital Stock Losses	Structural	0.00	0.00	0.00	0.00	0.00	0.00
	Non-Structural	0.00	0.00	0.00	0.00	0.00	0.00
	Content	0.00	0.00	0.00	0.00	0.00	0.00
	Inventory	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	Total	0.00	0.00	0.00	0.00	0.00	0.00

Source: HAZUS-MH

Table 5-67 Building Related Economic Loss Estimates 500 Year MRP Event (Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses	Wage	0.00	0.11	1.64	0.02	0.10	1.87
	Capital-Related	0.00	0.04	1.28	0.01	0.01	1.35
	Rental	0.10	0.51	1.01	0.02	0.04	1.68
	Relocation	0.37	0.35	1.37	0.10	0.23	2.41
	Subtotal	*0.47*	*1.01*	*5.30*	*0.16*	*0.39*	*7.32*
Capital Stock Losses	Structural	0.99	0.88	1.71	0.22	0.25	4.05
	Non-Structural	2.70	3.02	3.77	0.54	0.56	10.59
	Content	0.68	0.64	1.81	0.36	0.26	3.74
	Inventory	0.00	0.00	0.02	0.05	0.00	0.08
	Subtotal	*4.36*	*4.55*	*7.32*	*1.16*	*1.06*	*18.46*
	Total	**4.83**	**5.56**	**12.62**	**1.32**	**1.45**	**25.78**

Source: HAZUS-MH

For Transportation and Utility Lifeline System Losses, HAZUS-MH computes the direct repair cost for each component only. There are no losses computed by HAZUS-MH for business interruption due to lifeline outages. Long term economic impacts are estimated for 15 years after the earthquake. This information is quantified in terms of income and employment changes within the study area.

Table 5-68 Transportation System Economic Losses 100 Year MRP Event (Millions of Dollars)

System	Component	Inventory Value	Economic Loss ($)	Loss Ratio (%)
Highway	Segments	395.81	0.00	0.00
	Bridges	462.69	0.00	0.00
	Tunnels	0.00	0.00	0.00
	Subtotal	*858.50*	*0.00*	
Railways	Segments	7.98	0.00	0.00
	Bridges	0.33	0.00	0.00
	Tunnels	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	*8.30*	*0.00*	
Light Rail	Segments	0.00	0.00	0.00
	Bridges	0.00	0.00	0.00
	Tunnels	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
Bus	Facilities	2.57	0.00	0.02
	Subtotal	*2.60*	0.00	
Ferry	Facilities	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
Port	Facilities	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
Airport	Facilities	0.00	0.00	0.00
	Runways	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
	Total	**869.40**	**0.00**	

Source: HAZUS-MH

Table 5-69 Transportation System Economic Losses 500 Year MRP Event (Millions of Dollars)

System	Component	Inventory Value	Economic Loss ($)	Loss Ratio (%)
Highway	Segments	395.81	0.00	0.00
	Bridges	462.69	0.06	0.01
	Tunnels	0.00	0.00	0.00
	Subtotal	*858.50*	*0.10*	
Railways	Segments	7.98	0.00	0.00
	Bridges	0.33	0.00	0.00
	Tunnels	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	*8.30*	*0.00*	
Light Rail	Segments	0.00	0.00	0.00
	Bridges	0.00	0.00	0.00
	Tunnels	0.00	0.00	0.00

	Facilities	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
Bus	Facilities	2.57	0.07	2.77
	Subtotal	*2.60*	*0.10*	
Ferry	Facilities	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
Port	Facilities	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
Airport	Facilities	0.00	0.00	0.00
	Runways	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
	Total	**869.40**	**0.10**	

Source: HAZUS-MH

Table 5-70 Utility System Economic Losses 100 Year MRP Event (Millions of Dollars)

System	Component	Inventory Value	Economic Loss ($)	Loss Ratio (%)
Potable Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Distribution Lines	4.60	0.00	0.00
	Subtotal	*4.60*	*0.00*	
Waste Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Distribution Lines	2.80	0.00	0.00
	Subtotal	*2.76*	*0.00*	
Natural Gas	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Distribution Lines	1.80	0.00	0.00
	Subtotal	*1.84*	*0.00*	
Oil Systems	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
Electric Power	Facilities	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
Communication	Facilities	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
	Total	**9.19**	**0.00**	

Source: HAZUS-MH

Table 5-71 Utility System Economic Losses 500 Year MRP Event (Millions of Dollars)

System	Component	Inventory Value	Economic Loss ($)	Loss Ratio (%)
Potable Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Distribution Lines	4.60	0.00	0.06
	Subtotal	*4.60*	*0.00*	
Waste Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00

	Distribution Lines	2.80	0.00	0.05
	Subtotal	*2.76*	*0.00*	
Natural Gas	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Distribution Lines	1.80	0.00	0.03
	Subtotal	*1.84*	*0.00*	
Oil Systems	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
Electric Power	Facilities	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
Communication	Pipelines	0.00	0.00	0.00
	Subtotal	*0.00*	*0.00*	
	Total	**9.19**	0.00	

Source: HAZUS-MH

Table 5-72 Indirect Economic Impact with Outside Aid (Employment as number of people and income in millions of dollars) 100 and 500 Year MRP Event

	LOSS	**Total 100 Year Event**	**Percent 100 Year Event**	**Total 500 Year Event**	**Percent 500 Year Event**
First Year					
	Employment Impact	0	0.00	0	0.00
	Income Impact	0	0.00	0	-0.01
Second Year					
	Employment Impact	0	0.00	0	0.00
	Income Impact	0	0.00	(1)	-0.03
Third Year					
	Employment Impact	0	0.00	0	0.00
	Income Impact	0	0.00	(1)	-0.04
Fourth Year					
	Employment Impact	0	0.00	0	0.00
	Income Impact	0	0.00	(1)	-0.04
Fifth Year					
	Employment Impact	0	0.00	0	0.00
	Income Impact	0	0.00	(1)	-0.04
Years 6-15					
	Employment Impact	0	0.00	0	0.00
	Income Impact	0	0.00	(1)	-0.04

Source: HAZUS-MH

Addressing Repetitive Loss Properties **(NFIP data for floods, other hazards as available)**

The National Flood Insurance Program provides information on payments to homeowners resulting from losses due to flooding where a separate insurance policy for such events has been purchased. Under the earthquake category, flooding may be a secondary or resulting event brought about by a combination of ground motion, overflowing lakes and rivers due to ground motion and dam failures. Flooding events, repetitive loss properties and the associated analysis are discussed elsewhere in this report.

Estimating Potential Losses

Vulnerability in terms of dollar losses provides the study area and the State with a common framework in which to measure the effects of hazards on vulnerable structures.

HAZUS-MH was utilized to develop estimated losses based on three event scenarios. The analysis in Tables 5-73 to 5-80 reflects loss data for 100 and 500 year Mean Return Period earthquake events.

Table 5-73 Expected Building Damages by General Occupancy for 100 and 500 Year Mean Return Period Earthquake Events

Category	**100 Year Event**					**500 Year Event**				
	None	Slight	Moderate	Extensive	Complete	None	Slight	Moderate	Extensive	Complete
Agriculture	95	0	0	0	0	88	5	2	0	0
Commercial	1,415	0	0	0	0	1,303	78	29	4	0
Education	59	0	0	0	0	55	3	1	0	0
Government	80	0	0	0	0	74	4	1	0	0
Industrial	360	0	0	0	0	333	19	7	1	0
Other Residential	1,995	0	0	0	0	1,885	79	26	4	0
Religion	114	0	0	0	0	106	6	2	0	0
Single Family	8,091	0	0	0	0	7,766	255	61	9	1
Total	**12,209**	**0**	**0**	**0**	**0**	**11,610**	**449**	**130**	**18**	**2**

Source: HAZUS-MH

Table 5-74 Expected Building Damage by Building Type (All Design Levels) for 100 and 500 Year Mean Return Period Earthquake Events

Category	**100 Year Event**					**500 Year Event**				
	None	Slight	Moderate	Extensive	Complete	None	Slight	Moderate	Extensive	Complete
Wood	8,498	0	0	0	0	8,275	202	21	1	0
Steel	995	0	0	0	0	928	47	18	2	0
Concrete	297	0	0	0	0	277	15	5	0	0
Precast	69	0	0	0	0	62	4	3	1	0
Reinforced Masonry	343	0	0	0	0	321	13	7	1	0
Unreinforced Masonry	2,000	0	0	0	0	1,741	167	76	14	2
Manufactured Housing	6	0	0	0	0	5	1	0	0	0
Total	**12,209**	**0**	**0**	**0**	**0**	**11,610**	**449**	**130**	**18**	**2**

Source: HAZUS-MH

Table 5-75 Expected Damage to Essential Facilities (Number of Facilities) 100 Year Mean Return Period Event

Classification	Total	At Least Moderate Damage >50%	Complete Damage >50%	With Functionally >50% on day 1
Hospitals	2	0	0	2
Schools	16	0	0	16
EOCs	1	0	0	1
Police Stations	1	0	0	1
Fire Stations	8	0	0	8

Source: HAZUS-MH

Table 5-76 Expected Damage to Essential Facilities (Number of Facilities) 500 Year Mean Return Period Event

Classification	Total	At Least Moderate Damage >50%	Complete Damage >50%	With Functionality >50% on day 1
Hospitals	2	0	0	2
Schools	16	0	0	16
EOCs	1	0	0	1
Police Stations	1	0	0	1
Fire Stations	8	0	0	8

Source: HAZUS-MH

Table 5-77 Expected Damage to the Transportation Systems for 100 and 500 year Mean Return Period Events

System	Component	Number of Locations/ Segments	Number of Locations with At Least Moderate Damage	Number of Locations with Complete Damage	Functionality >50% After Day 1	Functionality >50% After Day 7
Highway	Segments	82	0	0	82	82
	Bridges	32	0	0	32	32
	Tunnels	0	0	0	0	0
Railways	Segments	4	0	0	4	4
	Bridges	3	0	0	3	3
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	2	0	0	2	2
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Source: HAZUS-MH

Note: Roadway segments, railroad tracks and light rain tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these facilities will not be computed.

HAZUS-MH performs a simplified system performance analysis for electric power and potable water.

Table 5-78 Expected Utility System Damage to for 100 and 500 Year Mean Return Period Event

System	Total No.	No. of Locations With at Least Moderate Damage	No. of Locations With Complete Damage	Functionality >50% After Day 1	Functionality > 50% After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Source: HAZUS-MH

Table 5-79 Expected Utility Pipeline Damage (Site Specific) for 100 and 500 Year Mean Return Period Event

System	Total Pipeline Length (in kms)	No. of Leaks (100 Year Event)	No. of Leaks (500 Year Event)	No. of Breaks (100 Year Event)	No. of Breaks (500 Year Event)
Potable Water	230	0	1	0	0
Waste Water	138	0	0	0	0
Natural Gas	92	0	0	0	0
Oil Systems	0	0	0	0	0

Source: HAZUS-MH

Table 5-80 Expected Potable Water and Electric System Performance for 100 and 500 Year Mean Return Period Event

System	Total Number of Households	No. Without Service at Day 1	No. Without Service at Day 3	No. Without Service at Day 7	No. Without Service at Day 30	No. Without Service at Day 60
Potable Water	20,921	0	0	0	0	0
Electric Power	20,921	0	0	0	0	0

Source: HAZUS-MH

Fires often occur after a substantial earthquake. Earthquakes may also damage or disrupt electric and natural gas service as well as domestic drinking water transmission lines. Fires may be fed by broken natural gas transmission lines, downed power lines and burn out of control due to a lack of water. HAZUS-MH used a Monte Carlo Simulation Model* to estimate the ignition of fires and the amount of burnt area. Displaced persons and the dollar value of buildings are also estimated by the model.

** Monte Carlo methods are a class of computational algorithms that on repeated random sampling to compute their results. Monte Carlo methods often used when simulating physical and mathematical systems. Because of their reliance on repeated computation and random or pseudo-random numbers, Monte Carlo methods are most suited to calculation by a computer. Monte Carlo methods tend to be used when it is infeasible or impossible to compute an exact result with a deterministic algorithm.*

Table 5-81 Fires Following Earthquake Data

Category	100 Year Earthquake Event	500 Year Earthquake Event
No. of Fires Ignited As A Result of an Earthquake	0	0
Square Miles of Area Burnt / % of Study Area	0	0
People Displaced as a Result of Fires	0	1
Value of Building Burned (in Millions of Dollars)	0	0

Source: HAZUS-MH

As a result of earthquakes, debris is generated as a result of damage to buildings and infrastructure as well as natural features such as trees and rock formations. HAZUS-MH estimates the amount of debris which can be generated by a particular earthquake event. The model breaks the debris into two general categories; Brick / Wood and Reinforced Concrete / Steel. This distinction is made due to the different types of material handling equipment required to handle the debris. Table 5-72 shows the amount of debris generated by event scenario.

Table 5-82 Debris Generated (Tons)

Category	100 Year Earthquake Event	500 Year Earthquake Event
Brick/Wood	0	3.5
Reinforced Concrete/Steel	0	1.5
Truck Loads @ 25 tons/truck	0	360

Source: HAZUS-MH

Analyzing Development Trends (New Buildings, Critical Facilities, Critical Infrastructure)

Section 4 of this plan Municipal Profile – Future Development identifies several areas in the City of White Plains where the potential for development or redevelopment exists. The New York State Building Code contains several sections which discuss construction requirements based on the potential for earthquakes in the State. New development should also take into consideration interior designs which would have greater stability in the event of an earthquake.

Additional Data and Next Steps

On a regional level, sufficient efforts exist to monitor earthquake activity in the area.

Overall Vulnerability Conclusion

The City of White Plains is located in an area that experiences moderate earthquake activity (some shaking). Earthquakes have occurred in the area occasionally and for the most part go undetected by people, and cause minimal or no damage. Future mitigation efforts should include making the public aware of the potential for earthquakes in the study area as well as both passive and active efforts to guard against potential for life threatening and damaging events. The HMPC ranking for earthquakes is "low".

Hazard Profile – Dam Failure

Description

Dams are manmade structures built for a variety of uses, including flood protection, power, agriculture, water supply, and recreation. Dams typically are constructed of earth, rock or concrete. Two factors that influence the potential severity of a full or partial dam failure are the amount of water impounded and the density, type, and value of development and infrastructure located downstream. Dam failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding, which result in overtopping
- Earthquake
- Inadequate spillway capacity resulting in excess overtopping flows
- Internal erosion caused by embankment or foundation leakage or piping
- Improper design
- Improper maintenance
- Failure of upstream dams on the same waterway
- Negligent operation
- Overtopping is the primary cause of earthen dam failure

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Associated water quality and health concerns could also be an issue. Dam construction, operation, maintenance and inspection are regulated by the New York State Department of Environmental Conservation.

Location and Extent

There are four dams located in the study area and one dam located outside City that would impact study area which details for each of which are indicated in Table 5-83.

Table 5-83 Dams in the Study Area

Location Number	NYSDEC ID Number	Name	Hazard Code	Built	Last Inspected	Type	Purpose	Owner
1	214-0278	White Plains Reservoir #1 Dam	C	1900	4/10/2008	CN – Concrete Gravity, MS - Masonry	Water Supply – Secondary	Local Government
2	214-0274	White Plains Reservoir #2 Dam	C	1907	4/10/2008	RE – Earth	Water Supply – Secondary	Local Government
3	214-0262	Silver Lake Dam	B	1815	3/21/2007	Re – Earth	Recreation	Local Government
4	214-0243	Lake Ridgeway Dam	A	1926	1/31/2008	MS – Masonry	Recreation	
5	214-0282	Kensico Dam	C	1916	10/15/2010	CN – Concrete Gravity, MS - Masonry	Flood Control and Storm Water Management, Water Supply - Primary	NYC DEP

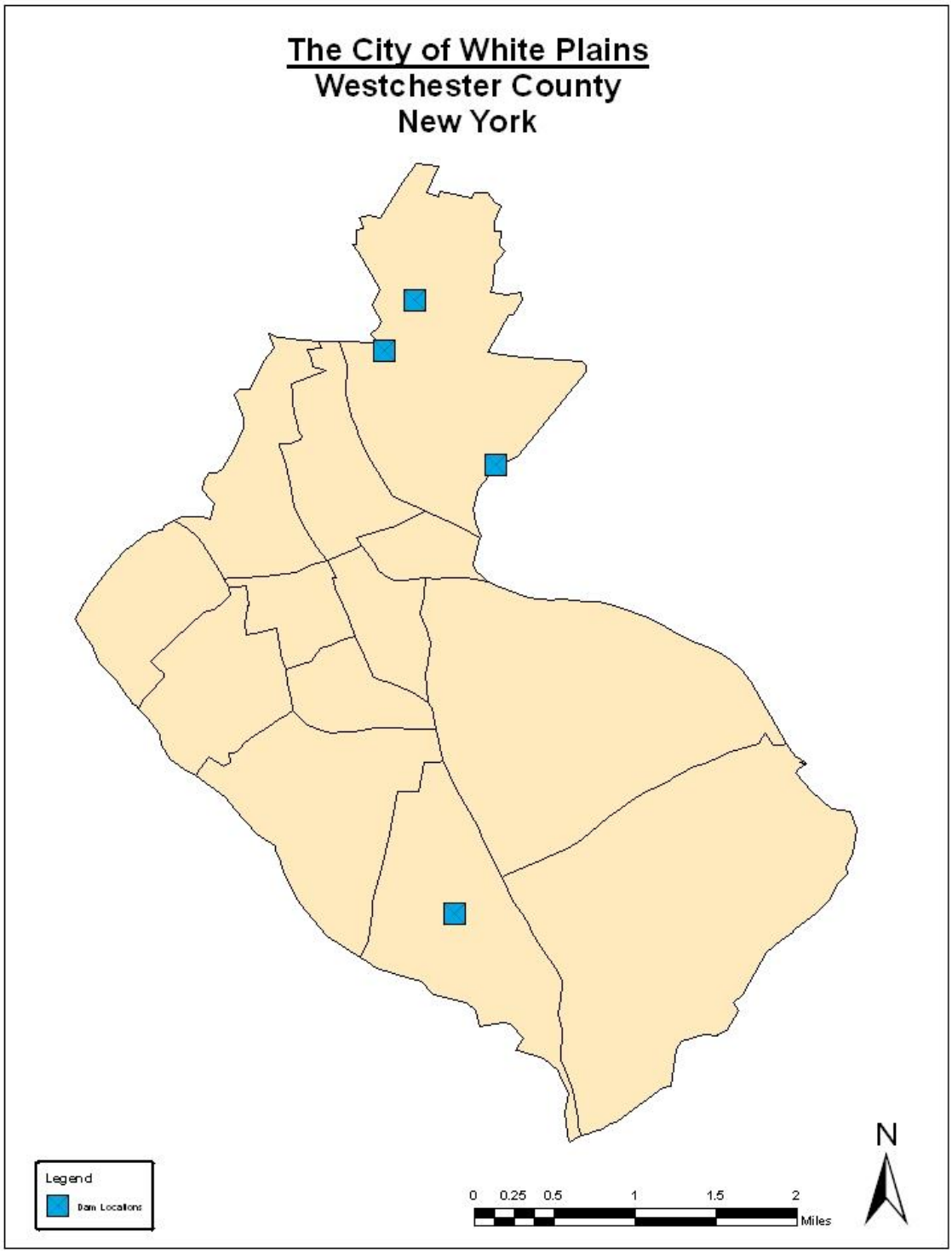
Source: NYSDEC Dam Inventory

The following describes the Hazard Codes of each dam as defined by the New York State Department of Environmental Conservation:

(1) Class A dams are located in areas where failure will damage nothing more than isolated buildings, undeveloped lands, or city or county roads and/or will cause no substantial economic loss or substantial environmental damage. Class A dams are considered to be Low Hazard dams.
(2) Class B dams are located in areas where failure may damage isolated homes, main highways, minor railroads, interrupt the use of relatively important public utilities and/or will cause substantial economic loss or substantial environmental damage. Class B dams are considered to be Intermediate Hazard dams.
(3) Class C dams are located in areas where failure may cause loss of human life, substantial damage to homes, industrial or commercial buildings, important public utilities, main highways or railroads and/or will cause extensive economic loss. Class C dams are considered to be High Hazard dams.

Although not physically located in the City of White Plains, the Kensico Reservoir Dam lies in close proximity to the study area and is classified as a high hazard (Class C) structure. The New York State Department of Environmental Protection has completed an Emergency Action Plan for the structure with the most recent revision to the Plan dated may 2009. Copies of the plan have been provided to first responders agencies in the study area. Of particular interest are inundation Maps 20 through 23 which show the impact on areas of the City of White Plains should a dam failure occur.

Figure5-34 Study Area Map with Dam Locations



Source: GIS Base Map and NYSDEC Dam Inventory

Previous Occurrences and Losses

There are no records of any of the dams located in the study area as having failed.

Probability of Future Events

The likelihood of a dam failure in the future is minimal. There would most likely be some warning before such an event with the event being secondary to heavy rain and associated flooding.

Vulnerability Assessment

Overview of vulnerability

While a dam failure is a rare event, impacts to property owners immediately adjoining these type facilities could be substantial.

Data and Methodology

The majority of the data used was obtained from the New York State Department of Environmental Conservation Dam Inventory records. Additionally, a review was made of records available from the National Dam Performance Program and National Inventory of Dams. Minimal information was available locally.

Impact on life, safety and health

Of the four dams in the study area, two (White Plains Reservoir #1 Dam and White Plains Reservoir #2 Dam) carry the highest hazard classification of "C" (see definitions above) as well as one dam outside the City (Kensico Dam) which would have an impact on the study area. A breach of any of these dams in the study area has the potential to cause property damage and generate a response by the City's Emergency Services organizations. The White Plains Reservoir #1 Dam, White Plains Reservoir #2 Dam and the Kensico Dam all have the potential to cause a life threatening situation should it fail. The City is in the process of having an Emergency Action Plan prepared (draft completed as of xx/xx/xxxx).

Identifying structures including general building stock, critical facilities and critical infrastructure

HAZUS – MH does not provide an analysis for general building stock, critical facilities or critical infrastructure for the dam failure hazard event. As part of its mitigation strategy, the City will implement a program to identify the downstream impact of a dam failure on these community features.

Economic Impact

The economic impact of a failure of any of the four dams in the study area and the one dam outside the City that would impact the study area is not part of the HAZUS-MH program. An analysis of the downstream impacts to general building stock, critical facilities and critical infrastructure will assist in developing this type of information.

Addressing Repetitive Loss Properties

The National Flood Insurance Program provides information on payments to homeowners resulting from losses due to flooding. Under the dam failure category, flooding may be a secondary or resulting event brought about by large volumes of water suddenly being released. Flooding events, repetitive loss properties and the associated analysis are discussed elsewhere in this report.

Estimating Potential Losses

HAZUS-MH does not estimated potential losses for dam failure events. This type of information will need to be developed and analyzed locally as part of the City of White Plains long term mitigation strategies.

Analyzing Development Trends (new buildings, critical facilities and Infrastructure)

Section 4 of this plan Municipal Profile – Future Development identifies several areas in the City of White Plains where the potential for development or redevelopment exists. Any structures, critical facilities and infrastructure contemplated in proximity of a dam, or downstream from a dam, need to be aware of the potential for flooding should a failure or overtopping occur.

Additional Data and Next Steps

One of the four dams located in the study area is privately owned. Where required by law, owners of all the dams needing an emergency action plan prepared will be notified in order to determine the potential impact to downstream life and property. The New York State Department of Environmental Protection is in the process of updated regulations concerning the ownership, operation and maintenance of dam facilities. The City will review these updates and inform facility owners where necessary.

Overall vulnerability conclusion

Dam failure has been determined to be a rare and thus a low risk event.

SECTION 6 – MITIGATION STRATEGIES

Introduction

The Mitigation Strategy section describes how the City of White Plains will reduce, control or limit potential losses of life and property from the natural hazards identified in the Risk Assessment section. Mitigation encompasses activities that prevent an emergency, diminish the chance of an emergency from occurring, or lessens the impacts of unavoidable emergencies. The strategy focuses on existing and potential mitigation actions and is the product of a coordinated effort by the City's departments and partners.

This Mitigation Strategy was developed consistent with the process and steps presented in the Federal Emergency Management Agency's (FEMA) Guide 386-3: Developing the Mitigation Plan. This section satisfies the following requirements:

Requirement §201.6(c)(3)(i): [The hazard mitigation strategy ***shall*** include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Requirement §201.6(c)(3)(ii): [The mitigation strategy ***shall*** include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

Requirement: §201.6(c)(3)(iii): [The mitigation strategy section ***shall*** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization ***shall*** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

The Mitigation Strategy section includes: the identification of goals and objectives; developing, evaluating and prioritizing alternate mitigation actions; preparing an implementation plan; and assessing the City's capabilities to implement the plan.

Goals and Objectives

The first step in developing a hazard mitigation strategy is to establish goals and objectives to reduce or eliminate the City's long-term vulnerability to natural hazard events. Goals and objectives are the foundation of an effective hazard mitigation plan. They establish a framework for identifying risks and developing strategies to mitigate those risks.

FEMA guidance describes *goals* as general guidelines that explain what a community wants to achieve. They are usually broad policy-type statements, long term and represent global visions. *Objectives* define strategies or implementation steps to attain the identified goals. *Mitigation actions* are specific actions that help a community achieve its goals and objectives.

Based on discussions with the Planning Committee, meetings with local officials and staff, and public input, the following goals and objectives provide the framework for developing the City's mitigation strategy.

Goal 1: Protect Life and Property

Objective 1.1 Reduce the impacts of hazards on vulnerable populations, homes, businesses and institutions
Objective 1.2 Integrate new hazards and risk information into enhancing local building codes and land use planning mechanisms
Objective 1.3 Educate residents and businesses about insurance coverage for natural hazards
Objective 1.4 Encourage property owners to take preventative actions especially in repetitive loss areas vulnerable to flooding
Objective 1.5 Adopt and enforce public policies to minimize impacts of development and enhance safe construction in hazard areas
Objective 1.6 Identify, pursue and maximize the use of outside sources of funding

Goal 2: Safeguard Critical Public Facilities & Infrastructure

Objective 2.1 Protect Critical assets
Objective 2.2 Protect Facility contents
Objective 2.3 Review and enhance redundancies for critical response networks
Objective 2.4 Incorporate mitigation strategies into capital improvement projects and maintenance upgrades

Goal 3: Maintain and Enhance Emergency Response Capabilities

Objective 3.1 Identify the need for and acquire any special emergency services, training and equipment
Objective 3.2 Ensure continuity of government operations, emergency services, and essential facilities during and immediately after disaster and hazard events
Objective 3.3 Integrate new hazard and risk information into emergency operation plans

Goal 4: Protect the Environment

Objective 4.1 Incorporate hazard considerations into natural resource protection
Objective 4.2 Implement mitigation actions that encourage environmental stewardship and protection of the environment

Goal 5: Increase Awareness & Preparedness

Objective 5.1 Develop education and outreach programs for the public, public officials, developers, realtors, contractors, and building owners
Objective 5.2 Enhance understanding of natural hazards and the risks they pose
Objective 5.3 Improve hazard information, including databases and maps
Objective 5.4 Partner with the private sector, local schools and institutions of higher learning about natural hazards and disaster preparedness
Objective 5.5 Support inter-governmental and inter-agency partnerships to foster hazard mitigation activities and projects.

Identification and Analysis of Mitigation Actions

Identification

Mitigation actions include programs, plans, projects, or policies that help reduce or eliminate the long-term risk to human life and property from natural hazards. The Planning Committee identified and analyzed a range of hazard-specific mitigation actions. Existing and potential mitigation actions were identified based on the following criteria:

- Reduce or eliminate the long-term risk to human and life and property from at least one of the seven natural hazards identified in the Risk Assessment Section
- Fall under one or more of the six FEMA mitigation action categories
- Achieve one or more of the five hazard mitigation goals and 20 objectives

There are six FEMA classifications of hazard mitigation strategies that can minimize loss of life and property and protect public health and safety during hazard events.

1. **Prevention**: Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.
2. **Property Protection**: Actions that involve the modification of existing buildings or structures to protect them from a hazard, or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
3. **Public Education and Awareness**: Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers and school-age and adult education programs.
4. **Natural Resource Protection**: Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
5. **Emergency Services**: Actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
6. **Structural Projects**: Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

Table 6-1 lists the mitigation actions identified by the Planning Committee and the natural hazards and mitigation goals and objectives they address.

Hazards							Table 6-1 Mitigation Actions	Goals & Objectives				
Flood	Severe	Severe Winter Storm	Earthquake	Extreme Heat	Drought	Dam Failure		Protect Life & Property	Safeguard Critical Facilities & Infrastructure	Enhance Maintain & Emergency Response Capabilities	Protect the Environment	Increase Public Awareness & Preparedness
X	X	X	X	X	X	X	1.Conduct inventory and assessment of public facilities and populations that may be vulnerable to natural hazards	1.1	2.1,2.2	3.2,3.3		
X	X	X	X	X	X	X	2.Revise City's capital budgeting process to include 3-5 year capital programming in order to identify priorities for mitigation measures and outside funding for natural hazards that impact City facilities, equipment, infrastructure and at-risk populations.	1.6	2.1,2.2,2.4	3.1		
X	X	X					3.Identify and pursue funding sources for flood abatement and drainage improvement projects involving public facilities, equipment, and infrastructure.	1.1	2.1,2.2	3.1,3.2		
X	X	X					4.Identify and pursue funding sources and other incentives to encourage and monitor flood resistant construction measures and practices for new construction and renovations in floodplains and repetitive flood loss areas.	1.1, 1.4, 1.6	2.1			
X	X	X					5.Evaluate participation in the CRS (Community Rating System) program.	1.1, 1.4, 1.6	2.1			
X	X	X	X		X		6.Integrate hazard resistant mitigation measures into the repair and rehabilitation of City facilities and infrastructure.		2.1,2.2,2.4	3.2		
X	X	X	X	X			7.Assess the capability to shelter residents during hazard events including the availability of adequate back-up power for cooling and heating at critical facilities.	1.1	2.1	3.2		

Hazards							Table 6-1 Mitigation Actions	Goals & Objectives				
Flood	Severe	Severe Winter Storm	Earthquake	Extreme Heat	Drought	Dam Failure		Protect Life & Property	Safeguard Critical Facilities & Infrastructure	Enhance Maintain & Emergency Response Capabilities	Protect the Environment	Increase Public Awareness & Preparedness
			X				8.For new or remodeled buildings enforce strict compliance with NYS Building Code earthquake construction recommendations.	1.1, 1.2				
X	X	X					9.Maintain and enhance cleaning of stormwater collection and conveyance system especially in flood prone areas.	1.1	2.1,2.2	3.2	4.1	
X	X	X					10.Partner with neighboring communities to encourage Westchester County to restore and add flood gauges on Bronx River and Mamaroneck River.	1.1	2.1,2.2	3.2	4.1	5.3,5.5
X	X	X	X	X	X	X	11.Update the emergency response plan.	1.1	2.3	3.2,3.3		
X	X	X		X			12.Investigate enhanced weather forecasting and warning systems.	1.1	2.1,2.2	3.2		5.2,5.3
X	X	X	X	X			13.Implement reverse 911 for City.	1.1, 1.4		3.2		5.1
X	X	X	X			X	14.Apply for new City-wide communication frequencies to include all emergency services.		2.3	3.2		
X	X	X	X	X			15.Upgrade and acquire new portable generators for emergency services.	1.1	2.1	3.2		
X	X	X	X	X	X	X	16.Continue to support and provide for training opportunities for emergency service personnel.	1.1	2.1,2.2	3.1,3.2		
X	X	X	X	X	X	X	17.Prepare and provide informational materials on natural hazard preparation for the City's website, Cable TV access channel, schools, community centers, day care centers, senior centers and other community venues.	1.1, 1.3, 1.4				5.1,5.2,5.3, 5.4
X	X	X	X				18.Integrate hazard mitigation measures into the Comprehensive Plan Update.	1.1, 1.2, 1.5			4.1, 4.2	5.2,5.3
X	X						19.Encourage low-impact design in order to reduce surface water flows.	1.2, 1.5			4.1, 4.2	

Hazards							Table 6-1 Mitigation Actions	Goals & Objectives				
Flood	Severe	Severe Winter Storm	Earthquake	Extreme Heat	Drought	Dam Failure		Protect Life & Property	Safeguard Critical Facilities & Infrastructure	Enhance Maintain & Emergency Response Capabilities	Protect the Environment	Increase Public Awareness & Preparedness
X	X	X			X		20.Revise and adopt an updated wetland local law and map.	1.2, 1.5			4.1, 4.2	
X	X						21.Make available a GIS link on the City website identifying floodplain and repetitive loss areas.	1.2				5.2,5.3
X	X						22.Revise, strengthen, and adopt a steep slope protection law.	1.2, 1.5			4.1, 4.2	
	X	X	X				23. Closely monitor the placement and maintenance of trees on public property and rights-of-way.	1.1	2.1,2.2	3.2		
X	X	X	X	X			24.Partner with utility providers to incorporate hazard mitigation measures into their maintenance operations and capital plans.	1.1	2.1,2.2	3.2	4.2	5.4
					X		25.Provide information to residents and businesses regarding water conservation measures.	1.1				5.1,5.2,5.4, 5.5
X	X	X	X	X	X	X	26.Develop a public information outreach program for residents, businesses, community groups and organizations including area colleges addressing concerns and risks of natural hazards as well as preparation and preventative measures.	1.1, 1.3				5.1,5.2,5.4, 5.5

Analysis

The Planning Committee next analyzed potential mitigation actions using the FEMA STAPLEE method. STAPLEE is an evaluation methodology to help identify the benefits and constraints of a particular mitigation action. The STAPLEE criteria are defined below.

- **S**ocial
  - Community Acceptance, public support and involvement
  - Consider effects on selected segments of the population
- **T**echnical
  - Technical Feasibility
  - Effective in reduction of long-term losses, impacts and risks
  - Effective in minimizing secondary losses
- **A**dministrative
  - Available staffing and funding to implement the proposed actions
  - Ability to maintain and manage the mitigation measures
- **P**olitical
  - Acceptable to and support by community elected officials
  - Public support and involvement
- **L**egal
  - Existing local and State authority to undertake an action
  - Meet regulatory requirements
  - Consider legal liabilities for an action
- **E**conomic
  - Costs and benefits of an action
  - Identify outside funding requirements
  - Burden to the tax base or local economy
- **E**nvironmental
  - Effect on land and water
  - Compliance with environmental laws and regulations
  - Consistent with community environmental goals

Table 6-2 summarizes the STAPLEE evaluation of potential mitigation actions. The seven STAPLEE evaluation criteria were assigned a plus (+), if the proposed action is favorable; a minus (-), if the action is unfavorable; or a Not Applicable (N) if the evaluation criteria does not apply to the mitigation action.

TABLE 6-2 STAPLEE ACTION EVALUATION: THE CITY OF WHITE PLAINS

Alternative Actions	STAPLEE Criteria Considerations **+** Favorable **-** Less Favorable **N** Not Applicable																				
	S (Social)		**T** (Technical)			**A** (Administrative)			**P** (Political)			**L** (Legal)			**E** (Economic)				**E** (Environmental)		
	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocation	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Consistent with Community Environmental Goals	Consistent with Federal Laws
1.Conduct inventory and assessment of public facilities and populations that may be vulnerable to natural hazards.	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	N	-	N	N	N
2.Revise City's capital budgeting process to include 3-5 year capital programming in order to identify priorities for mitigation measures and outside funding for natural hazards that impact City facilities, equipment, infrastructure and at-risk populations.	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	+	N	N	N	N
3.Identify and pursue funding sources for flood abatement and drainage improvement projects involving public facilities, equipment, and infrastructure.	+	+	+	+	+	+	N	+	+	+	+	+	+	+	+	+	+	-	+	+	N
4.Identify and pursue funding sources and other incentives to encourage and monitor flood resistant construction measures and practices for new construction and renovations in floodplains and repetitive flood loss areas.	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	+	+	+	N	N
5.Evaluate participation in the CRS (Community Rating System) program.	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	+	+	+	N	N

TABLE 6-2 STAPLEE ACTION EVALUATION: THE CITY OF WHITE PLAINS																					
Alternative Actions	STAPLEE Criteria Considerations + Favorable - Less Favorable **N** Not Applicable																				
	S (Social)		**T** (Technical)			**A** (Administrative)			**P** (Political)			**L** (Legal)			**E** (Economic)				**E** (Environmental)		
	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocation	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Consistent with Community Environmental Goals	Consistent with Federal Laws
6.Integrate hazard resistant mitigation measures into the repair and rehabilitation of City facilities and infrastructure.	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	N	+	+	N	N
7.Assess the capability to shelter residents during natural hazard events including the availability of adequate back-up power for cooling and heating at critical facilities.	+	+	+	+	+	+	+	N	+	+	+	+	+	N	+	+	N	+	N	N	N
8.For new or remodeled buildings enforce strict compliance with NYS Building Code earthquake construction recommendations.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	N	N
9.Maintain and enhance cleaning of stormwater collection and conveyance system especially in flood prone areas.	+	+	+	-	+	+	+	+	+	+	+	N	+	N	+	-	+	-	+	N	N
10.Partner with neighboring communities to encourage Westchester County to restore and add flood gauges on Bronx River and Mamaroneck River.	+	+	+	+	+	-	-	-	+	+	+	+	+	N	+	+	+	-	+	N	N
11.Update the emergency response plan.	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	+	N	N	N	N
12. Investigate enhanced weather forecasting and warning systems.	+	+	+	-	+	+	-	+	+	+	+	N	+	N	+	+	+	N	N	N	N
13.Implement reverse 911 for the City.	+	+	+	-	+	+	-	-	+	+	+	+	+	N	+	-	N	-	N	N	N

TABLE 6-2 STAPLEE ACTION EVALUATION: THE CITY OF WHITE PLAINS

Alternative Actions	STAPLEE Criteria Considerations **+** Favorable **-** Less Favorable **N** Not Applicable																			
	S (Social)		**T** (Technical)			**A** (Administrative)			**P** (Political)			**L** (Legal)			**E** (Economic)				**E** (Environmental)		
	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocation	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Consistent with Community Environmental Goals	Consistent with Federal Laws
14.Apply for new City-wide communication frequencies to include all emergency services.	+	+	+	-	+	+	+	+	+	+	+	+	+	N	+	+	+	N	N	N	N
15.Upgrade and acquire new portable generators for emergency service personnel.	+	+	+	-	+	+	+	+	+	+	+	N	+	N	+	-	+	-	N	N	N
16.Continue to support and provide for training opportunities for emergency service personnel.	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	+	N	N	N	N
17.Prepare and provide informational materials on natural hazard preparation for the City's website, Cable TV access channel, schools, community centers, day care centers, senior centers and other community venues.	+	+	+	+	+	+	+	N	+	+	+	+	+	N	+	+	+	+	+	+	+
18.Integrate hazard mitigation measures into the Comprehensive Plan Update.	+	+	+	+	+	+	-	N	+	+	+	+	+	+	+	+	+	+	+	+	+
19. Encourage low-impact design in order to reduce surface water flows.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	+	+
20.Revise and adopt an updated wetland local law and map.	+	+	+	+	+	+	-	N	+	+	+	+	+	+	+	+	N	+	+	+	+
21.Make available a GIS link on the City website identifying floodplain and repetitive loss areas.	+	+	+	+	+	+	-	+	+	+	+	+	+	N	+	+	+	N	+	+	+
22.Revise, strengthen, and adopt a steep slope protection law.	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	N	+	+	+	+

TABLE 6-2 STAPLEE ACTION EVALUATION: THE CITY OF WHITE PLAINS																				
Alternative Actions	STAPLEE Criteria Considerations + Favorable - Less Favorable **N** Not Applicable																			
	S (Social)		**T** (Technical)			**A** (Administrative)			**P** (Political)			**L** (Legal)			**E** (Economic)				**E** (Environmental)		
	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocation	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Consistent with Community Environmental Goals	Consistent with Federal Laws
23.Closely monitor the placement and maintenance of trees on public property and rights-of-way.	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	N	N	N	N	N
24.Partner with utility providers to incorporate hazard mitigation measures into their maintenance operations and capital plans.	+	+	+	+	+	+	-	+	+	+	+	+	+	N	+	+	N	-	N	N	N
25. Provide information to residents and businesses regarding water conservation measures.	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	+	+	+	+	+
26.Develop a public information outreach program for residents, businesses, community groups and organizations including area colleges addressing concerns and risks of natural hazards as well as preparation and preventative measures.	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	+	+	+	+	+

Prioritization and Benefit/Cost Review

Prioritization

Section 201.c.3.iii of 44 CFR requires that the review of alternative mitigation actions include a description of how they will be prioritized including a benefit/cost review. The HMPC researched the methodology included in other recently approved Hazard Mitigation Plans. Accordingly, the mitigation actions identified earlier in this section were prioritized according to the criteria defined below.

High Priority: A project that meets multiple goals and objectives, benefits exceed cost, has funding secured under existing programs or authorizations, or is grant-eligible, and can be completed in 1 to 5 years (short-term project) once the project is funded.

Medium Priority: A project that meets at least one plan goal and objective, benefits exceed cost, funding has not been secured and would require a special funding authorization under existing programs, grant eligibility is questionable, and can be completed in 1 to 5 years once the project is funded.

Low Priority: A project that will mitigate the risk of a hazard, benefits exceed costs, funding has not been secured, and project is not grant-eligible and/or timeline for completion is considered long term (5 to 10 years).

Benefit/Cost Criteria

As part of the prioritization process, Section 201.6(c)(3)(iii) of 44 CFR requires that attention be paid on the extent to which benefits are maximized according to a cost benefit review of the mitigation actions and their associated costs. A benefit-cost analysis is a method for determining the potential positive effects of a specific mitigation action and comparing them to the cost of the action.

As described below this benefit/cost analysis did not include the level of detail required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) grant program. A more qualitative approach was used for a variety of reasons including the timing and available funding for implementation of the project as the associated costs and benefits could change dramatically over time. Therefore, a review of the apparent benefits versus the apparent cost of each project was performed.

Ratings of high, medium, or low was assigned to the costs and benefits of the mitigation actions and are defined below.

<u>Cost Rating Definition</u>

High: Existing funding levels are not adequate to cover the costs of the proposed project and would require an increase in revenue through an alternative source (for example, bonds, grants, and fee increases) to implement.

Medium: The project could be implemented with existing funding but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.

Low: The project could be funded under the existing budget. The project is part of or can be part of an existing, ongoing program.

Benefit Rating Definition

High: Project will have an immediate impact on the reduction of risk exposure to life and property.

Medium: Project will have a long-term impact on the reduction of risk exposure to life and property or project will provide an immediate reduction in the risk exposure to property.

Low: Long-term benefits of the project are difficult to quantify in the short term.

Using this approach, projects with positive benefit versus cost ratios (such as high over high, high over medium, medium over low, etc.) are considered cost-beneficial and are prioritized accordingly.

If the City decides to seek funding for projects from FEMA's HMGP or PDM programs the required detailed benefit/cost analysis will be done as part of the application preparation and submission. The City intends to pursue an overall mitigation strategy with benefits that exceeds costs. For projects not seeking financial assistance from grant programs that require a detailed cost/benefit analysis, "benefits" will be evaluated according to parameters that meet its needs and the goals and objectives of this plan. The prioritization of mitigation actions will also be reviewed and updated as needed annually as part of the plan maintenance strategy described in Section 7 of this plan.

Table 6-3 presents the prioritization of alternate mitigation actions by the methodology described above. The prioritization evaluation took into consideration the number of objectives met; cost/benefit analysis, and the availability of funding.

Table 6-3 Prioritization of Alternative Mitigation Actions

Mitigation Action #	Applies to New (N) and/or Existing (E) Structures	Goals & Objectives	# of Objectives Met	Benefits	Costs	Cost/ Benefit (Y/N)	Grant Eligible (Y/N)	Can Project Be Funded under Existing Programs/Budgets (Y/N)	Priority
1.	NA	1.1,2.1,2.2,3.2	4	M	L-M	Y	N	Y	M
2.	N,E	1.6,2.1,2.2,2.4,3.1	5	M	L	Y	N	Y	M-L
3.	N,E	1.1,2.1,2.2,3.1,3.2	5	M	L	Y	N	Y	M
4.	N,E	1.1,1.4,1.6,2.1	4	M	L	Y	N	Y	H
5.	N,E	1.1,1.4,1.6,2.1	4	M	M	Y	N	Y	H
6.	E	2.1,2.2,2.4,3.2	4	M	M	Y	N	N	M
7.	NA	1.1,2.1,3.2	3	M	L	Y	N	N	H
8.	N,E	1.1,1.2	2	M	L	Y	N	Y	H
9.	N,E	1.1,2.1,2.2,3.2,4.1	5	H	L	Y	N	Y?	H
10.	N,E	1.1,2.1,2.2,3.2,5.5	5	M	L	Y	Y	N	L-M
11.	NA	1.1,2.3,3.2,3.3	4	M	L	Y	N	Y?	M-H
12.	NA	1.1,2.1,2.2,3.2,5.2,5.3	6	M	L	Y	N	Y	H
13.	NA	1.1,1.4,3.2,5.1	4	M-H	H	Y	Y	N	M
14.	NA	2.3,3.2	2	L	L	Y	N	Y	M-H
15.	NA	1.1,2.1,2.2,3.2	4	M	M-H	Y	Y	N	M
16.	NA	1.1,2.1,2.2,3.1,3.2	5	L	L-M	Y	N	Y	H
17.	N,E	1.1,1.3,1.4,5.1,5.2,5.4	6	H	L-M	Y	N	Y	M
18.	N,E	1.1,1.2,1.5,4.1,4.2,5.2,5.3	7	M	L-M	Y	N	N	M
19.	N,E	1.2,1.5,4.1,4.2	4	M	L-M	Y	N	Y	M
20.	N,E	1.2,1.5,4.1,4.2	4	M	L-M	Y	N	N	M
21.	NA	1.2,5.2,5.3	3	M	L-M	Y	N	Y	H
22.	N,E	1.2,1.5,4.1,4.2	4	M	L-M	Y	N	N	M
23.	N,E	1.1,2.1,2.2,3.2	4	H	L	Y	N	Y	H
24.	NA	1.1,2.1,2.2,3.2,4.2,5.4	6	M	L	Y	N	Y	H
25.	NA	1.1,5.1,5.2,5.4,5.5	5	H	L	Y	N	Y	H
26.	N,E	1.1,1.3,5.1,5.2,5.4,5.5	6	H	L-M	Y	N	Y	M-H

Capability Assessment

Performing a Capability Assessment is an important part of preparing a hazard mitigation plan. A mitigation planning Capability Assessment consists of taking an in-depth look at community mechanisms (such as plans, codes, ordinances, etc.) that can affect the successful implementation of identified and prioritized mitigation actions. It provides information that can be used to develop an approach for Plan integration (the step of identifying how the plan, once it is adopted, will tie into existing plans, policies, regulations, and procedures), who in the jurisdiction will take the lead on moving forward with the mitigation actions, and the administrative, technical, regulatory and fiscal resources in the municipality.

FEMA has developed local hazard mitigation capability questionnaires that assist the community in identifying its legal and regulatory authority, administrative, technical and fiscal resources. Tables 6-4 through 6-6 represent the Capability Assessment for the City of White Plains.

Table 6-4 Legal and Regulatory Authority

Regulatory Tools (ordinances, codes, plans)	Local Authority (Y/N)	Does State Prohibit (Y/N)	Higher Level Jurisdiction Authority (Y/N)	Codes, Ordinances and Plans
Building Code	Y	N	Y	
Zoning Ordinance	Y	N	N	
Subdivision ordinance or regulations	Y	N	N	
Special purpose ordinances (floodplain management, stormwater management, hillside or steep slope ordinances, wildfire, hazard setback requirements	Y	N	N	
Growth management ordinances (also called "smart growth" or anti-sprawl programs)	N	N	N	
Site plan review requirements	Y	N	N	
General or Comprehensive Plan	Y	N	N	
A capital improvements plan	Y	N	N	
An economic development plan	N	N	N	
An emergency response plan	Y	N	N	
A post-disaster recovery plan	N	N	N	
A post-disaster recovery ordinance	N	N	N	
Real estate disclosure requirements	N	N	N	

Table 6-5 Administrative and Technical Capability

Staff/Personnel Resources	Yes/No	Department and Position
Planner (s) or engineer(s) with knowledge of land development and land management practices		
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure		
Planner(s) or engineers(s) with an understanding of natural and/or human caused hazards		
Floodplain manager		
Surveyors		
Staff with education or expertise to assess the community's vulnerability to hazards		
Personnel skilled in GIS and/or HAZUS		
Scientists familiar with the hazards of the community		
Emergency manager		
Grant writer		

Table 6-6 Fiscal Capability

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community Development Block Grants (CDGB)	
Capital Improvements project funding	
Authority to levy taxes for specific purposes	
Fees for water, sewer, gas or electric service	
Impact fees for home buyers or developers for new developments/homes	
Incur debt through general obligation bonds	
Incur debt through special tax bonds	
Incur debt through private activity bonds	
Withhold spending in hazard-prone areas	
Other	

National Flood Insurance Program and Community Rating System

The National Flood Insurance Program (NFIP) provides federally backed flood insurance that encourages communities to enact and enforce floodplain regulations. To be covered by a flood insurance policy, a property must be in a community that participates in the NFIP. To qualify for the program, a community adopts and enforces a floodplain management ordinance to regulate development in flood hazard areas. The City of White Plains participates in the NFIP.

The NFIP's Community Rating System (CRS) was implemented in 1990 as a program recognizing and encouraging floodplain management activities that exceed the minimum NFIP standards. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the goals of CRS.

The City does not currently participate in the CRS program but intends to consider joining the program as one of its mitigation strategies (mitigation strategy #5). In addition, the Plan's risk assessment which provides historical flood information and the mitigation strategies developed as part of this Plan meet the Floodplain Management Plan criteria under Activity 510 in the CRS program and will be utilized in the development of the City's CRS Program.

As part of the City's efforts to reduce the risks associated with flooding and flood losses, the Department of Public Works and the Building Department will assess their current operating procedures against those outlined by the Federal Emergency Management Agency in the Flood Insurance Program (NFIP) to insure actions that address the administration of the City's National Flood Insurance Program participation. Where not currently in place, an educational effort for the public as well as municipal staff and common council members will be developed as outlined in Table 6-7 Item #5, posted in the City website and made available for distribution from the Department of Public Works (255 Main St, White Plains, NY, 10601) and the Build Department (7-11 South Broadway, White Plains, NY, 10601). The educational effort will include a package consisting of a welcome letter to the program and will include contract information for the City's NFIP Coordinator, reference the Multi-Hazard Mitigation Plan and copies of educational material downloaded from FEMA/NFIP website or obtained from the FEMA publications warehouse.

All new construction, additions or modifications to structures within the 100 year and 500 year floodplains, or within 500 feet of the floodplain boundaries will receive as part of their permitting/building process package, copies of all relevant floodplain information. The latest copies of the City's Flood Insurance Rate Maps dated September 2007 are available for review at the Department of Public Works (255 Main St, White Plains, NY, 10601) and the Build Department (70 Church Street, White Plains, NY, 10601) during normal business hours. These September 2007 FIRMS were reviewed by the City and determined accurate and that no additional studies were needed at the time. The 100 year and 500 year FIRMS are shown on maps of the City in Figure 5-1 and 5-2 and a map of the Repetitive Loss areas are shown on a map of the City in Figure 5-9A, in Section 5, Risk Assessment – Flood.

There will be one person from the Department of Public Works and the Building Department who will be knowledgeable of the responsibilities for coordinating the operation and updating the City NFIP. There is one designated person for contact and published information purposes. New and updated training needs will be determined by the Coordinator and training sessions sponsored by FEMA, the Association of the State Floodplain managers, the New York State Floodplain and Stormwater Managers Association or other professional organization will be scheduled as available. The City will join a professional floodplain organization. At the present time, there is no Community Assistance Visit (CAV) anticipated or scheduled.

Implementation

The Implementation Strategies found in Table 6- 7 identifies the following categories of information for each mitigation action that will guide White Plains in the implementation and administration of the actions: hazard description, lead and supporting agencies, timeframe, cost, and funding source. It also

serves to coordinate the various departments involved to avoid duplicating or conflicting efforts. The Implementation Table contains a variety of prioritized actions that mitigate the effects of natural hazards on the population and property of the City.

Table 6-7 Implementation Strategies

Hazard	Mitigation Action	Lead Agency	Supporting Agency	Project Timeline (Years)	Estimated Project Cost	Possible Funding Source	FEMA Category P= prevention PP = property protection PE= public education NR= natural resources ES= emergency services SP=structural projects	Goals And Objectives
All	1.Conduct inventory and assessment of public facilities and populations that may be vulnerable to natural hazards.							
All	2.Revise City's capital budgeting to include 3-5 year capital programming in order to identify priorities for mitigation measures and outside funding for natural hazards that impact City facilities, equipment, infrastructure and at-risk populations.							
Flood, Severe Storm, Severe Winter Storm	3.Identify and pursue funding sources and other incentives to encourage and monitor flood resistant construction measures and practices for new construction and renovations in floodplains and repetitive flood loss areas.							
Flood, Severe Storm, Severe Winter Storm	4.Identify and pursue funding sources and other incentives to encourage and monitor flood resistant construction measures and practices for new construction and renovations in floodplains and repetitive flood loss areas.							
Flood, Severe Storm, Severe Winter Storm	5.Evaluate participation in the CRS (Community Rating System) program.							

Hazard	Mitigation Action	Lead Agency	Supporting Agency	Project Timeline (Years)	Estimated Project Cost	Possible Funding Source	FEMA Category P= prevention PP = property protection PE= public education NR= natural resources ES= emergency services SP=structural projects	Goals And Objectives
Flood, Severe Storm, Severe Winter Storm, Earthquake, Drought	6.Integrate hazard resistant mitigation measures into the repair and rehabilitation of City facilities and infrastructure.							
Flood, Severe Storm, Severer Winter Storm, Earthquake, Extreme Heat	7.Assess the capability to shelter residents during natural hazard events including the availability of adequate back-up power for cooling and heating at critical facilities.							
Earthquake	8.For new or remodeled buildings enforce strict compliance with NYS Building Code earthquake construction recommendations.							
Flood, Severe Storm, Severe Winter Storm	9.Maintain and enhance cleaning of stormwater collection and conveyance system especially in flood prone areas.							
Flood, Severe Storm, Severe Winter Storm	10.Partner with neighboring communities to encourage Westchester County to restore and add flood gauges on Bronx River and Mamaroneck River.							
All	11. Update the emergency response plan.							
Flood, Severe Storm, Severe Winter Storm, Extreme Heat	12. Investigate enhanced weather forecasting and warning systems.							

Hazard	Mitigation Action	Lead Agency	Supporting Agency	Project Timeline (Years)	Estimated Project Cost	Possible Funding Source	FEMA Category P= prevention PP = property protection PE= public education NR= natural resources ES= emergency services SP=structural projects	Goals And Objectives
Flood, Severe Storm, Severe Winter Storm, Earthquake, Extreme Heat	13.Implement reverse 911 for City.							
Flood, Severe Storm, Severe Winter Storm, Dam Failure	14.Apply for new City-wide communication frequencies to include all emergency services.							
Flood, Severe Storm, Severe Winter Storm, Earthquake, Extreme Heat	15.Upgrade and acquire new portable generators for emergency service personnel.							
All	16.Continue to support and provide for training opportunities for emergency service personnel.							
All	17.Prepare and provide informational materials on natural hazard preparation for the City's website, Cable TV access channel, schools, community centers, day care centers, senior centers and other community venues.							
Flood, Severe Storm, Severe Winter Storm, Earthquake	18.Integrate hazard mitigation measures into the Comprehensive Plan Update.							
Flood, Severe Storm	19. Encourage low-impact design in order to reduce surface water flows.							
Flood, Severe Storm, Severe Winter Storm, Drought	20.Revise and adopt an updated wetland local law and map.							

Hazard	Mitigation Action	Lead Agency	Supporting Agency	Project Timeline (Years)	Estimated Project Cost	Possible Funding Source	FEMA Category P= prevention PP = property protection PE= public education NR= natural resources ES= emergency services SP=structural projects	Goals And Objectives
Flood, Severe Storm	21.Make available a GIS link on the City website identifying floodplain and repetitive loss areas.							
Flood, Severe Storm	22.Revise, strengthen, and adopt a steep slope protection law.							
Severe Storm, Severe Winter Storm, Earthquake	23.Closely monitor the placement and maintenance of trees on public property and rights-of-way.							
Flood, Severe Storm, Severe Winter Storm, Earthquake, Extreme Heat	24.Partner with utility providers to incorporate hazard mitigation measures into their maintenance operations and capital plans.							
Drought	25. Provide information to residents and businesses regarding water conservation measures.							
All	26.Develop a public information outreach program for residents, businesses, community groups and organizations including area colleges addressing concerns and risks of natural hazards as well as preparation and preventative measures.							

Legend

BLDG = City Building Inspector/Building Department
CS = City Community Services Department
DPW = City Department of Public Works
FEMA = Federal Emergency Management Agency
HMGP = Hazard Management Grant Program
IS = City Information Services Department
NYS DEC = NYS Department of Environmental Conservation
NYSDOT = NYS Department of Transportation
PB = Planning Board
PDM = Pre-Disaster Mitigation
PL = City Planner
SEMO = NYS Emergency Management Office
CE = City Engineer
WC = Westchester County
WCDP = Westchester County Department of Planning
WCGIS = Westchester County GIS Office
WCOEM = Westchester County Office of Emergency Management

Estimated Project Cost Key

L = Low: Less than $10,000
M = Medium: Between $10,000 and $100,000
H = High: Over $100,000

SECTION 7: PLAN MAINTENANCE PROCESS

Plan Maintenance Process

Section 201.6(c)(4) of 44 CFR requires a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle. It is a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate and a discussion on how the community will continue public participation in the plan maintenance process.

Monitoring, Evaluating and Updating the Plan

The City of White Plains has established a mechanism to monitor, evaluate, and update its Multi-Hazard Mitigation Plan, implement the plan through existing municipally sponsored programs and, solicit continued public involvement with plan maintenance.

Monitoring

Shall be an ongoing process conducted by City of White Plains Department of Public Works in cooperating with other municipal agencies having responsibility for implementing the various mitigation strategies and coordinating with the Hazard Mitigation Planning Committee (HMPC) on an annual basis via a report memorandum to be submitted by January 31st of each year for activities undertaken and completed during the previous calendar year. The Hazard Mitigation Planning Committee will meet annually to review the memorandum report prepared by the Department of Public Works on mitigation activities and additionally, immediately after any disaster event warranting a reexamination of the mitigation actions being implemented or proposed for future implementation. Monitoring of the plan minimally on an annual basis will allow the HMPC to access which projects have been completed, those which may no longer be possible, those requiring modification of scope, as well as current and future funding needs. The public will be updated annually by way of an advertised publicly held meeting and posting in the emergency management section of the City website.

Implementation of Strategies and Annual Review

Upon approval of the City's Multi-Hazard Mitigation Plan by the Federal Emergency Management Agency, the City will begin the process of implementing the strategies outline in Table 6-7. The HMPC will meet to review the 26 mitigation actions indicated in table 6-7 and the respective lead Agency and associated supporting agencies will take responsibility for their respective mitigations actions with the goal of implementation with the projected timelines. The department Head of the Respective lead Agency will have overall responsibility for the implementation of his/her associated mitigation actions. Those mitigation actions capable of being undertaken within the current budget year funding capabilities of the City of White Plains will be undertaken immediately. Projects in need of funding will wait for the annual budgetary process to begin, or the City may seek to fund projects through borrowing, or seek funding through grants or finding by other agencies.

Within six (6) months of plan approval by the Federal Emergency Management Agency, Lead Agency Department Heads will provide a written report to the Commissioner of Public Works and the HMPC

on the ability to implement their respective mitigation actions within the projected timeline. Individual mitigation actions will be classified using four (4) parameters including those actions which are Funded, Unfunded, Underway, in need of Modification or Completed. Unfunded projects will be submitted to the Common Council for consideration of funding within the projected timelines in Table 6-7 as part of the City's Operating or Long Range (Strategic) funding process. The Common Council will also seek outside funding sources such as grants or outright funding by the other agencies and institutions.

Twelve (12) months after Plan approval by the Federal Emergency Management Agency, the Commissioner of Public Works and the HMPC will meet to review the past years mitigation action implementation efforts and report on the progress to the Common Council.

Status reports on mitigation efforts will be made every six (6) months by the respective lead agency Department Heads to the Commissioner of Public Works and the HMPC. The Commissioner of Public Works and the HMPS will determine if a meeting of the HMPC is needed immediately or if the report shows satisfactory progress and can be reviewed at the Annual HMPC review. Both six (6) month interim and twelve (12) month annual reports on mitigation actions implementation will be available on the City's website http://www.whiteplains.org and will be available for public inspection during regular business hours at the Department of Public Works (255 Main St, White Plains, NY 10601).

Evaluating

Evaluation of progress of the mitigation strategies effort will be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions, and/or
- Increased vulnerability as a result of new development (and/or annexation).

Updates to this plan will:

- Consider changes in vulnerability due to project implementation,
- Document success stories where mitigation efforts have proven effective,
- Document areas where mitigation actions were not effective,
- Document any new hazards that may arise or were previously overlooked,
- Incorporate new data or studies on hazards and risks,
- Incorporate new capabilities or changes in capabilities,
- Incorporate growth and development-related changes to city inventories, and
- Incorporate new project recommendations or changes in project prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the HMPC will monitor the following process:

- A representative from the responsible office identified in each mitigation measure will be responsible for tracking and reporting on an annual basis to the Commissioner of Public Works on project status and provide input on whether the project as implemented meets the defined objectives and is likely to be successful in reducing vulnerabilities.

- If the project does not meet identified objectives, the HMPC will determine what additional measures may be implemented and an assigned individual will be responsible for defining project scope, implementing the project, monitoring success of the project, and making any required modifications to the plan.

Changes will be made to the plan to accommodate for projects that have failed or are not considered feasible after a review for their consistency with established criteria, the time frame, municipal priorities, and/or funding resources. Priorities that were not ranked high but were identified as potential mitigation strategies will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the plan will be by written changes and submissions, as the HMPC deems appropriate and necessary, and as approved by the City of White Plains Board of Trustees. In keeping with the process of adopting the plan, a public involvement process to receive public comment on plan maintenance and updating will be held during the annual review period, and the final product will be adopted by Board.

Updating the Plan

The Multi-Hazard Mitigation Plan will be upgraded every 5 years (beginning 5 years after approval of the original by FEMA) and will include the adjustments based on the annual reviews by those implementing the mitigation strategies and the Hazard Mitigation Plan Committee. The HMPC will recommend to the City of White Plains Common Council how best to implement the needed changes to the plan. The HMPC will meet as deemed necessary until all updates and /or changes have been completed and incorporated into the Multi-Hazard Mitigation Plan. Upon preliminary approval of updates and/or changes to the plan by the City of White Plains Common Council, the plan will be resubmitted to FEMA for approval.

The formal process of updating the City's Multi-Hazard Mitigation Plan will begin eighteen (18) months prior to the five (5) year anniversary of the Plan's original approval by the Federal Emergency Management Agency. This will allow the HMPC, Lead Agencies and Supporting Agencies to thoroughly evaluate what has taken place to date, what mitigation actions have been completed, an analysis of why mitigations actions may have not been funded, what has changed with respect to natural hazards which no longer or have only begun to impacting the City, what data updates are available from the resource agencies and documents utilized in the development of the plan (especially HAZUS-MH) and what the actual changes to the Multi-Hazard Mitigation Plan will consist of.

Upon approval of the initial Plan by the Federal Emergency management Agency, copies will be provided to those municipal and private sector agencies outlines in Section 3: Planning Process, Step 3, Coordinate with other agencies and departments. This will allow agencies and departments which may operate and maintain infrastructure within the boundaries of the City of White Plains to become aware of the City's proposed mitigation activities so that any infrastructure improvements proposed by those agencies and departments may be coordinated and not adversely impact one another. As part of its six (6) and twelve (12) month review and reporting process, the City will notify other departments and agencies having operation and maintenance responsibilities for infrastructure within the boundaries of the City of White Plains of any proposed structural improvements to infrastructure which may impact their respective facilities.

Table 7-1 Timeline for Plan Maintenance and Update

Date / Item	Initial Plan Approval By FEMA	6 Months	12 Months	18 Months	24 Months	30 Months	36 Months	42 Months	48 Months	54 Months	60 Months
Initial Plan Approval By FEMA	■										
Status Report on Efforts to CPW/HMPC/CCC		■		■		■		■		■	
Annual Mitigation Action Implementation Effort Review			■		■		■		■		■
Posting of 6 and 12 Month Reports on Website	■	■	■	■	■	■	■	■	■	■	■
Begin 5 Year Plan Update Process								■			
5 Year Update Process On-Going								■	■	■	■
Notify Other Departments and Agencies of Proposed Changes to Mitigation Actions and Invite Comments								■	■	■	■
Inform Public of Update Process and Invite Comments								■	■	■	■
Finalize Update and Submit to NYSEMO/FEMA											■

CPW – Commisioner of Public Works
HMPC – Hazard Mitigation Plan Committee
CCC – City's Common Council

Incorporation into Existing Planning Mechanisms

Upon approval of the City of White Plains Multi-Hazard Mitigation Plan, copies of the document will be distributed to all participating municipal departments and other interested agencies. The goal is to integrate the various program elements of the Hazard Mitigation Plan into the everyday operations of the City of White Plains and other interested agencies.

Table 7-2 below identifies existing organizational functions of the City of White Plains through which the mitigation plan may be implemented.

Table 7-2 Existing Functions and Programs for Mitigation Plan Implementation in the City of White Plains

Function	Action	Implementation of the Plan in the City of White Plains
Administrative	Department work plans, policies and procedures	• White Plains Department of Public Works and Engineering • White Plains Building Department • White Plains Planning and Zoning Board
Administrative	Other agency plans	• Westchester County Emergency Management Plan • Westchester County Health Department • Westchester County Department of Transportation • New York State Department of Transportation • New York State Thruway Authority • Metro-North Commuter Railroad
Administrative	Jobs and job descriptions	• Volunteer/contractual assistance for hazard mitigation plan maintenance • Assistance for grant applications and administration
Budgetary	Capital and operating budgets	• Annual review of operating and capital budget plans for inclusion of mitigation actions
Regulatory	Executive Orders, ordinances and other directives	• Comprehensive Planning – include hazard mitigation considerations for new construction and land use • Zoning and Ordinances • Building Codes • Stormwater Management Plan • Capital Improvement Plan – Evaluate all new construction with respect to proximity to high hazard areas, floodplains in order to mitigate risk • Continue participation in the National Flood Insurance Program • Changes to any of the above plans to consider they are consistent with hazard mitigation plan
Funding	Secure traditional sources of financing	• Consider user fees to finance projects • Apply for grants from federal, state and county governments, nonprofit organizations, foundations, other private sources and Pre-Disaster Mitigation Program (PDM-DMA 2000), Flood Mitigation Assistance Program (FMA), and the Hazard Mitigation Grant Program (HMGP-Stafford Act, Section 404) • Utilize Research grant opportunities through U.S. Department of Housing and Urban Development Community Development Block Grant (CDBG) • Utilize other potential funding sources including: - Stafford Act, Section 406 – Public Assistance Program Mitigation Grants - Federal Highway Administration - Catalog of Federal Domestic Assistance - U.S. Fire Administration – Assistance to Firefighters - U.S. Small Business Administration Pre and Post Disaster Mitigation Loans - U.S. Department of Economic Development Administration Grants

		- U.S. Army Corps of engineers - National Fish and Wildlife Federation - New York State Department of Environmental Conservation - Other sources as they become available
Partnerships	Develop creative partnerships, funding and incentives	• Public-Private Partnerships • State and Local Government Cooperation • In-kind resources
Partnerships	Existing Committees and Councils	• Long Island Sound Watershed Inter-municipal Council (LISWIC) • White Plains B.I.D. • Neighborhood and Property Owners Associations
Partnerships	Working with other federal, state and local agencies	• American Red Cross • Federal Emergency Management Agency • National Weather Service • New York State Emergency Management Office

Source: City of White Plains

Continued Public Involvement

The City of White Plains is responsible for maintaining an element of public involvement in the hazard mitigation process as well as its maintenance and updating. Copies of the City of White Plains Multi-Hazard Mitigation Plan will be maintained and be made available for review at the following locations:

City Hall
Office of the City Clerk
255 Main Street
White Plains, New York 10601

White Plains Public Library
100 Martine Avenue
White Plains, NY 10601

City of White Plains Website
http://www.cityofwhiteplains.com

Following the Hazard Mitigation Planning Committee's annual review effort, any document changes will be made and appended the documents at the locations listed above. A notice of the plan updates will be posted annually on the City's website.

The Commissioner of Public Works will be responsible for ensuring sufficient notice to the public of the annual plan review and for receiving, tracking and filing public comments regarding the Multi-Hazard Mitigation Plan. Contact information will be provided in all documents referencing the Multi-Hazard Mitigation Plan.

The public will be notified of and given the opportunity to comment on the plan at the annual review meeting and to participate in the 5 year plan update. The Commissioner of Public Works will be responsible for the overall plan implementation and update effort including coordination among

municipal, outside agency and private sector entities. The Commissioner of Public Works will ensure that sufficient opportunity exists for soliciting comments and receiving feedback, be responsible for collecting and reviewing comments and where appropriate incorporating them into the 5 year plan update. The HMPC will meet for the annual review and at other times as needed.

APPENDIX A – ADOPTED RESOLUTION

"THE BIRTHPLACE OF THE STATE OF NEW YORK"
OFFICE OF THE MAYOR

THOMAS M. ROACH
MAYOR

t: 914.422.1411
f: 914.422.1395

TO THE HONORABLE MEMBERS OF THE COMMON COUNCIL OF THE CITY OF WHITE PLAINS

To enable the City of White Plains to obtain grants or funding from the Federal Emergency Management Agency (FEMA) administered by the New York State Division of Homeland Security and Emergency Services, the City must first establish a committee to assist in the process of creating an engineering type Hazard Mitigation Plan, and establish a committee chair. The City has received a grant award, and the funding was obligated on September 28, 2012, in the amount of $125,000.00. At its meeting of January 3, 2012, the White Plains Common Council approved $125,000 in funding to cover the cost of an emergency generator for Fire Station No. 7 (Ridgeway and North Street.) In order for the grant funds to be disbursed, FEMA requires that the Hazard Mitigation Plan be in place and approved by both federal and state agencies.

The purpose of the local hazard mitigation plan is to protect life and property, safeguard critical public facilities and infrastructure, maintain and enhance emergency response capabilities, protect the environment, and increase awareness and preparedness resulting from natural disasters such as, flooding, hurricanes, winter storms, hail storms, drought, extreme heat, earthquake, wildfire and tornado. The process begins with an engineering risk assessment, then a strategy is developed, and a maintenance element is included.

At this time I am requesting authorization for the creation of the City of White Plains Hazard Mitigation Plan and appointing Joseph J. Nicoletti, Jr., Commissioner of Public Works as the Chairman, with Brian M. Murphy, 2nd Deputy Commissioner of Public Works, as the alternate. Commissioner Nicoletti is currently the City's local administrator of FEMA related laws pertaining to flood damage prevention. To develop the City's plan, the Commissioner will establish a committee consisting of various government representatives and agencies to address FEMA's technical questions, as well as community representatives. The group will craft a technical plan through a coordinated and collaborative partnership, although the vast majority of this document of approximately 250 pages will be generated in-house by the DPW Engineering Bureau. The draft plan will be presented to you for your input, followed by the completed plan which will be presented for final approval.

Thomas M. Roach, Mayor

Dated: December 3, 2012

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255 Main Street • White Plains, New York 10601
www.cityofwhiteplains.com

STATE OF NEW YORK }
COUNTY OF WESTCHESTER } ss.:
CITY OF WHITE PLAINS }

I, the undersigned, City Clerk, of the City of White Plains, NY, do hereby certify that I have compared the preceding with the original resolution adopted by the Common Council of the City of White Plains, NY, by the affirmative vote of a majority of the members of the Common Council at a Regular Stated Meeting, held the 3rd December 2012 and I do hereby certify the same to be a correct transcript therefrom and of the whole of said original.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the corporate seal of the City of White Plains, NY, this 4th December 2012.

Anne M. McPherson, RMC, CMC
City Clerk, City of White Plains, NY

CERTIFIED COPY

from the

CITY OF WHITE PLAINS
255 Main Street
White Plains, NY 10601

CERTIFIED COPY

of a(an)

RESOLUTION

in relation to

Resolution of the Common Council of the City of White Plains authorizing the Mayor to create the City of White Plains Hazard Mitigation Plan, the appointment of the Commissioner of Public Works as Chairman, and authorizing the Commissioner of Public Works to establish a Committee consisting of various governments and agencies to craft a technical plan for final approval by the Common Council for submission to the Federal Emergency Management Agency (FEMA), in connection with a $125,000 Grant from FEMA to cover the cost of an emergency generator for Fire Station No. 7 (Ridgeway and North Street)

ADOPTED BY THE

COMMON COUNCIL

of the

CITY OF WHITE PLAINS

3rd December 2012

RESOLUTION OF THE COMMON COUNCIL OF THE CITY OF WHITE PLAINS AUTHORIZING THE MAYOR TO CREATE THE CITY OF WHITE PLAINS HAZARD MITIGATION PLAN, THE APPOINTMENT OF THE COMMISSIONER OF PUBLIC WORKS AS CHAIRMAN, AND AUTHORIZING THE COMMISSIONER OF PUBLIC WORKS TO ESTABLISH A COMMITTEE CONSISTING OF VARIOUS GOVERNMENTS AND AGENCIES TO CRAFT A TECHNICAL PLAN FOR FINAL APPROVAL BY THE COMMON COUNCIL FOR SUBMISSION TO THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) IN CONNECTION WITH A $125,000 GRANT FROM FEMA TO COVER THE COST OF AN EMERGENCY GENERATOR FOR FIRE STATION NO.7 (RIDGEWAY AND NORTH STREET).

WHEREAS, to enable the City of White Plains to obtain grants or funding from the Federal Emergency Management Agency (FEMA) administered by the New York State Division of Homeland Security and Emergency Services, the City must first establish a committee to assist in the process of creating an engineering type Hazard Mitigation Plan, and establish a committee chair, and

WHEREAS, the City has received a grant award from FEMA, and the funding was obligated on September 28, 2012, in the amount of $125,000; and

WHEREAS, at the Common Council of January 3, 2012, the Common Council approved $125,000 in funding to cover the cost of an emergency generator for Fire Station No. 7 (Ridgeway and North Street); and

WHEREAS, in order for the grant funds to be disbursed, FEMA requires that the Hazard Mitigation Plan be in place and approved by both federal and state agencies; and

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WHEREAS, the purpose of the local Hazard Mitigation Plan is to protect life and property, safeguard critical public facilities and infrastructure, maintain and enhance emergency response capabilities, protect the environment, and increase awareness and preparedness resulting from natural disasters such as flooding, hurricanes, winter storms, hail storms, drought, extreme heat, earthquake, wildfire and tornado; and

WHEREAS, the process begins with an engineering risk assessment, then a strategy is developed, and a maintenance element is included; and

WHEREAS, the legislative body is required by FEMA to authorize the Mayor to create the City of White Plains Hazard Mitigation Plan.

NOW, THEREFORE, BE IT

RESOLVED, that the Mayor is hereby authorized to create the City of White Plains Hazard Mitigation Plan and appoint Joseph J. Nicoletti, Jr, the City's Commissioner of Public Works, and the City's local administrator of FEMA related laws pertaining to flood damage prevention, and Brian M. Murphy, 2nd Deputy Commissioner of Public Works as the alternate; and be it further

RESOLVED, to develop the City's Hazard Mitigation Plan, the Commissioner shall establish a committee consisting of various government representatives and agencies to address

FEMA's technical questions, as well as community representatives; and be it further

RESOLVED, that the Committee will craft a technical plan through a coordinated and collaborative partnership, but with a major portion of the Hazard Mitigation Plan to be generated in-house by the Engineering Bureau of the Department of Public Works; and be it further

RESOLVED, that the draft plan will be presented to the Common Council for input, followed by a completed Hazard Mitigation Plan which will be presented for final approval by the Common Council prior to submission to FEMA.

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APPENDIX B – ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations

ARC American Red Cross
CBD Central Business District
CEMP Comprehensive Emergency Management Plan
CFR Code of Federal Regulations
CIP Capital Improvement Program
CRS Community Rating System
DEM Digital Elevation Model
DHS Department of Homeland Security
DMA 2000 Disaster Mitigation Act of 2000
DPW Department of Public Works
DR Disaster Declarations
EM Emergency Management
EMP Emergency Management Plan
EMS Emergency Medical Services
EOC Emergency Operation Center
EOP Emergency Operation Plan
EPA U.S. Environmental Protection Agency
FAA Federal Aviation Administration
FD Fire Department
FEMA Federal Emergency Management Agency
FHMP Flood Hazard Mitigation Program
FHWA Federal Highway Administration
FIA Flood Insurance Administration
FIRM Flood Insurance Rate Map
FMAP Flood Mitigation Assistance Program
GIS Geographic Information System
HAZUS Hazards U.S.
HAZUS-MH Hazards U.S. Multi-Hazard
HAZMAT Hazardous Material
HAZNY Hazards New York
HMGP Hazard Mitigation Grant Program
HMP Hazard Mitigation Plan
ICS Incident Command System
IT Information Technology
MGD Million gallons per day
MOA Memorandum of Agreement
MRP Mean Return Period
N/A Not Applicable
NA Not Available
NCDC National Climate Data Center
NDMC National Drought Mitigation Center
NEHRP National Earthquake Hazard Reduction Program
NESEC Northeast States Emergency Consortium
NFIP National Flood Insurance Program
NFIRS National Fire Incident Reporting System

NFPA National Fire Protection Association
NID National Inventory of Dams
NIMS National Incident Management System
NLCD National Land Cover Dataset
NOAA National Oceanic and Atmospheric Administration
NPDP National Performance of Dams Program
NPL National Priorities List
NRCS Natural Resource Conservation Service
NWS National Weather Service
NY New York
NYC New York City
NYCDEP New York City Department of Environmental Protection
NYS New York State
NYSDEC New York State Department of Environmental Conservation
NYSDOH New York State Department of Health
NYSDOT New York State Department of Transportation
NYSFSMA New York State Floodplain and Stormwater Managers Association
NYSEMO New York State Emergency Management Office
NYSOFPC New York State Office of Fire Prevention and Control
NYS TMC New York State Traffic Management Center
% Percent
PBS Public Broadcast System
PD Police Department
PDM Pre-Disaster Mitigation Program
PGA Peak Ground Acceleration
Pop Population
PSA Public Service Announcement
SBA Small Business Association
SDWIS Safe Drinking Water Information System
SHELDUS Spatial Hazard Events and Losses Database for United States
SLOSH Sea, Lake and Overland Surges from Hurricanes
Sq.mi. Square mile
TBD To Be Determined
TRI Toxic Release Inventory
USACE United States Army Corps of Engineers
USDA United States Department of Agriculture
USEPA United States Environmental Protection Agency
USDOT United States Department of Transportation
USFA United States Fire Administration
USFWS United States Fish and Wildlife Service
USGS United States Geological Survey
WCOEM Westchester County Office of Emergency Management
WWTP Wastewater Treatment Plant

APPENDIX C – GLOSSARY OF TERMS

Glossary of Terms

This resource defines terms that are used in or support the risk assessment document. These definitions were based on terms defined in documents utilized to prepare this document, with modifications as appropriate to address the City of White Plains specific definitions and requirements.

100-year flood – A flood that has a 1-percent chance of being equaled or exceeded in any given year. This flood event is also referred to as the base flood. The term "100-year flood" can be misleading; it is not the flood that will occur once every 100 years. Rather, it is the flood elevation that has a 1- percent chance of being equaled or exceeded each year. Therefore, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood, which is the standard used by most federal and state agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management to determine the need for flood insurance.

500-year flood – A flood that has a 0.2-percent chance of being equaled or exceeded in any one year.

Aggregate Data – Data gathered together across an area or region (for example, census tract or census block data).

Annualized Loss – The estimated long-term value of losses from potential future hazard occurrences of a particular type in any given single year in a specified geographic area. In other words, the average annual loss that is likely to be incurred each year based on frequency of occurrence and loss estimates. Note that the loss in any given year can be substantially higher or lower than the estimated annualized loss.

Annualized Loss Ratio – Represents the annualized loss estimate as a fraction of the replacement value of the local building inventory. This ratio is calculated using the following formula: Annualized Loss Ratio = Annualized Losses / Exposure at Risk. The annualized loss ratio gauges the relationship between average annualized loss and building value at risk. This ratio can be used as a measure of relative risk between hazards as well as across different geographic units

Areal Locations of Hazardous Atmospheres (ALOHA) – A computer program that uses information provide by the user, along with physical property data from its chemical library, to predict how a hazardous gas cloud might disperse in the atmosphere after an accidental chemical release. ALOHA can predict rates of chemical release from broken gas pipes, leaking tanks, and evaporating puddles. ALOHA can model the dispersion of both neutrally buoyant and heavier-than-air gases.

Asset – Any man-made or natural feature that has value, including but not limited to people, buildings, infrastructure (such as bridges, roads, and sewer and water systems), and lifelines (such as electricity and communication resources or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks).

At-Risk – Exposure values that include the entire building inventory value in census blocks that lie within or border the inundation areas or any area potentially exposed to a hazard based on location.

Base Flood – Flood that has a 1-percent probability of being equaled or exceeded in any given year. It is also known as the 100-year flood.

Base Flood Elevation (BFE) – Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The BFE is used as the standard for the National Flood Insurance Program.

Benefit – Net project outcomes, usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of conducting a benefit-cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including a reduction in expected property losses (building, content, and function) and protection of human life.

Benefit-cost analysis (BCA) – Benefit-cost analysis is a systematic, quantitative method of comparing the projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Building – A structure that is walled and roofed, principally aboveground and permanently fixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.

Building Codes – Regulations that set forth standards and requirements for construction, maintenance, operation, occupancy, use, or appearance of buildings, premises, and dwelling units. Building codes can include standards for structures to withstand natural disasters.

Capability Assessment – An assessment that provides a description and analysis of a community or state's current capacity to address the threats associated with hazards. The capability assessment attempts to identify and evaluate existing policies, regulations, programs, and practices that positively or negatively affect the community or state's vulnerability to hazards or specific threats.

Community Rating System (CRS) – CRS is a program that provides incentives for National Flood Insurance Program communities to complete activities that reduce flood hazard risk. When the community completes specific activities, the insurance premiums of these policyholders in communities are reduced.

Comprehensive Plan – A document, also known as a "general plan", covering the entire geographic area of a community and expressing community goals and objectives. The plan lays out the vision, policies, and strategies for the future of the community, including all of the physical elements that will determine the community's future development. This plan can discuss the community's desired physical development, desired rate and quantity of growth, community character, transportation services, location of growth, and siting of public facilities and transportation. In most states, the comprehensive plan has no authority in and of itself, but serves as a guide for community decision-making.

Critical Facility – Facilities that are critical to the health and welfare of the population and that are especially important following a hazard. Critical facilities include essential facilities, transportation systems, lifeline utility systems, high-potential loss facilities, and hazardous material facilities. As defined for the City of White Plains risk assessment, this category includes police stations, fire and/or EMS stations, major medical care facilities and emergency communications.

Dam Failure – A partial or complete breach in a dam, which impacts its integrity. Dam failures occur for a number of reasons such as flash flooding, inadequate size of spillways, mechanical failure of valves and other equipment, rodent activities in earthen dams, freezing and thawing cycles, earthquakes, and intentional destruction.

Debris – The scattered remains of assets broken or destroyed during the occurrence of a hazard. Debris caused by a wind or water hazard event can cause additional damage to other assets.

Digital Elevation Model (DEM) – U.S. Geological Survey (USGS) Digital Elevation Model (DEM) data files that are digital representations of cartographic information in a raster form. DEMs include a sampled array of elevations for a number of ground positions at regularly spaced intervals. These digital cartographic/geographic data files are produced by USGS as part of the National Mapping Program.

Displacement Time – After a hazard occurs, the average time (in days) that a building's occupants must operate from a temporary location while repairs are made to the original building due to damages resulting from the hazard.

Disaster Mitigation Act of 2000 (DMA 2000) – Law that requires and rewards local and state predisaster planning, promotes sustainability as a strategy for disaster resistance, and is intended to integrate state and local planning with the aim of strengthening state-wide mitigation planning.

Drought – A period of time without substantial rainfall that persists from one year to the next. Droughts can affect large areas and can impact areas that range from a few counties to several states. Along with decreasing water supplies for human consumption and use, droughts can kill crops, livestock, grazing land, edible plants, and even in severe cases, trees.

Duration – The length of time a hazard occurs.

Earthquake – A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of earth's tectonic plates.

Erosion – Wearing away of the land surface by detachment and movement of soil and rock fragments, during a flood or storm or over a period of years, through the action of wind, water, or other geologic processes.

Erosion Hazard Area – Area anticipated to be lost to shoreline retreat over a given period of time. The projected inland extent of the area is measured by multiplying the average annual long-term recession rate by the number of years desired.

Essential Facility – A facility that is important to ensure a full recovery of a community or state following the occurrence of a hazard. These facilities can include: government facilities, major employers, banks, schools, and certain commercial establishments (such as grocery stores, hardware stores, and gas stations). For the City of White Plains risk assessment, this category was defined to include schools, colleges, shelters, adult living and adult care facilities, medical facilities and health clinics, hospitals.

Exposure – The number and dollar value of assets that are considered to be at risk during the occurrence of a specific hazard.

Extent – The size of an area affected by a hazard or the occurrence of a hazard.

Federal Emergency Management Agency (FEMA) – Independent agency (now part of the Department of Homeland Security) created in 1978 to provide a single point of accountability for all federal to disaster activities related mitigation and emergency preparedness, response, and recovery.

Fire Potential Index (FPI) – Developed by USGS and the U.S. Forest Service (USFS) to assess and map the potential for a fire hazard over broad, defined areas. Based on such geographic information, national policy makers and "on-the-ground" fire managers established priorities for prevention activities in the defined areas to reduce the risk of managed and wildfire ignition and spread. This index helps to shorten the time between fire ignition and initial attack by enabling fire managers to pre-allocate, target, and stage suppression forces to high-fire risk areas.

Flash Flood – A flood occurring with little or no warning where water levels rise at an extremely fast rate.

Flood – A general and temporary condition of partial or complete inundation of normally dry land areas resulting from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.

Flood Depth – Height of the flood water surface above the ground surface.

Flood Elevation – Height of the water surface above an established datum (for example, the National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or mean sea level).

Flood Hazard Area – Area shown to be inundated by a flood of a given magnitude on a map.

Flood Information Tool (FIT) – Hazard U.S. Multi-Hazard (HAZUS-MH) - related tool designed to process and convert locally available flood information to data that can be used by the HAZUS-MH Flood Module. The FIT is a system of instructions, tutorials and geographic information system (GIS) analysis scripts. When provided with user-supplied inputs (such as ground elevations, flood elevations, and floodplain boundary information), the FIT calculates flood depth and elevation for river and coastal flood hazards.

Flood Insurance Rate Map (FIRM) – Map of a community, prepared by the FEMA that shows both the special flood hazard areas and the risk premium zones applicable to the community.

Flood Insurance Study (FIS) – A study that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.

Flood Mitigation Assistance (FMA) Program – A program created as a part of the National Flood Insurance Report Act of 1994. FMA provides funding to assist communities and states in implementing actions that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other NFIP insurance structures, with a focus on repetitive loss properties.

Floodplain – Any land area, including a watercourse, susceptible to partial or complete inundation by water from any source.

Flood Polygon – A geographic information system vector file outlining the area exposed to the flood hazard. HAZUS-MH generates this polygon at the end of the flood computations in order to analyze the inventory at risk.

Flood Zone A – An area inundated by 100 year flooding for which no Base Flood Elevations (BFE's) have been established.

Flood Zone AE - An area inundated by 100 year flooding for which BFE's have been determined.

Flood Zone AH – An area inundated by 100 year flooding (usually an area of ponding), for which BFE's have been determined; flood depths range from 1 to 3 feet.

Flood Zone A02 - An area inundated by 100 year flooding for which no BFE's have been established
.
Flood Zone A07 - An area inundated by 100 year flooding for which no BFE's have been established.

Flood Zone B - An area inundated by 500 year flooding; an area inundated by 100 year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100 year flooding.

Flood Zone C - An area that is determined to be outside the 100 and 500 year floodplains.

Flood Zone X - An area that is determined to be outside the 100 and 500 year floodplains.

Frequency – A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1-percent chance of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.

Fujita Scale of Tornado Intensity – Rates tornadoes with numeric values from F0 to F5 based on tornado wind speed and damage sustained. An F0 (wind speed less than 73 mph) indicates minimal damage such as broken tree limbs or signs, while an F5 (wind speeds of 261 to 318 mpg) indicated severe damage sustained.

Goals – General guidelines that explain what you want to achieve. They are usually broad policy-type statements, long term in nature, and represent global visions.

Geographic Information Systems (GIS) – A computer software application that relates data regarding physical and other features on the earth to a database to be used for mapping and analysis.

GIS Shape Files – A type of GIS vector file developed by ESRI for their ArcView software. This type of file contains a table and a graphic. The records in the table are linked to corresponding objects in the graphic.

Hailstorm – Storm associated with spherical balls of ice. Hail is a product of thunderstorms or intense showers. It is generally white and translucent, consisting of liquid or snow particles encased with layers of ice. Hail is formed within the higher reaches of a well-developed thunderstorm. When hailstones become too heavy to be caught in an updraft back into the clouds of the thunderstorm (hailstones can be caught in numerous updrafts adding a coating of ice to the original frozen droplet of rain each time), they fall as hail and a hailstorm ensues.

Hazard – A source of potential danger or an adverse condition that can cause harm to people or cause property damage. For this risk assessment, priority hazards were identified and selected for the pilot project effort. A natural hazard is a hazard that occurs naturally (such as flood, wind, and earthquake). A man-made hazard is one that is caused by humans (for example, a terrorist act or a hazardous material spill). Hazards are of concern if they have the potential to harm people or property.

Hazards of Interest – A comprehensive listing of hazards that may affect an area.

Hazards of Concern – Those hazards that have been analytically determined to pose significant risk in an area, and thus the focus of the particular mitigation plan for that area (a subset of the Hazards of Interest).

Hazard Identification – The process of identifying hazards that threaten an area.

Hazardous Material Facilities – Facilities housing industrial and hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins.

Hazard Mitigation – Sustained actions taken to reduce or eliminate the long-term risk and effects that can result from the occurrence of a specific hazard. For example, building a retaining wall can protect an area from flooding.

Hazard Mitigation Grant Program (HMGP) – Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster.

Hazard Mitigation Plan – A collaborative document in which hazards affecting the community are identified, vulnerability to hazards assessed, and consensus reached on how to minimize or eliminate the effects of these hazards.

Hazard Profile – A description of the physical characteristics of a hazard, including a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.

Hazard Risk Gauge – The graphic icon used during the initial planning process to convey the relative risk of a given hazard in the study area. The scale ranges from green indicating relatively low or no risk to red indicating severe risk.

Hazard Analysis New York (HAZNY) - Developed by the American Red Cross and the New York State Emergency Management Office (NYSEMO) on October 2, 2003. It is an automated interactive spreadsheet that asks specific questions on potential hazards in a community and records and evaluates the responses to these questions.

Hazards U.S. (HAZUS) – A GIS-based nationally standardized earthquake loss estimation tool developed by FEMA. HAZUS was replaced by HAZUS-MH (see below) in 2003.

Hazards U.S. – Multi-Hazard (HAZUS-MH) – A GIS-based nationally standardized earthquake, flood, and wind loss estimation tool developed by FEMA. The purpose of this pilot project is to demonstrate and implement the use of HAZUS-MH to support risk assessments.

HAZUS-MH Risk Assessment Methodology – This analysis uses the HAZUS-MH modules (earthquake, wind-hurricane and flood) to analyze potential damages and losses. For this pilot project risk assessment, the flood and hurricane hazards were evaluated using this methodology.

HAZUS-MH-Driven Risk Assessment Methodology – This analysis involves using inventory data in HAZUS-MH combined with knowledge such as (1) information about potentially exposed areas, (2) expected impacts, and (3) data regarding likelihood of occurrence for hazards. For this risk assessment, a HAZUS-Driven Risk Assessment Methodology could not be used to estimate losses associated with any hazards because of a lack of adequate data. However, the methodology was used, based on more limited data to estimate exposure for the dam failure, urban fire, fuel pipeline breach, and HazMat release hazards.

High Potential Loss Facilities – Facilities that would have a high loss associated with them, such as nuclear power plants, dams, and military installations.

Hurricane – An intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74 miles-per-hour or more and blow in a large spiral around a relatively calm center or "eye." Hurricanes develop over the North Atlantic Ocean, northeast Pacific Ocean, or the South Pacific Ocean (east of 160°E longitude). Hurricane circulation is counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.

Hydraulics – That branch of science, or of engineering, which addresses fluids (especially, water) in motion, its action in rivers and canals, the works and machinery for conducting or raising it, its use as a prime mover, and other fluid-related areas.

Hydrology – The science of dealing with the waters of the earth (for example, a flood discharge estimate is developed through conduct of a hydrologic study).

Infrastructure – The public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, transportation system (such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, dry docks, piers and regional dams).

Intensity – A measure of the effects of a hazard occurring at a particular place.

Inventory – The assets identified in a study region. It includes assets that can be lost when a disaster occurs and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

Landslide – Downward movement of a slope and materials under the force of gravity.

Level 1 Analysis – A HAZUS-MH analysis that yields a rough estimate or preliminary analysis based on the nationwide default database included in HAZUS-MH. A Level 1 analysis is a great way to begin the risk assessment process and prioritize high-risk communities without collecting or using local data.

Level 2 Analysis – A HAZUS-MH analysis that requires the input of additional or refined data and hazard maps that will produce more accurate risk and loss estimates. Assistance from local emergency management personnel, city planners, GIS professionals, and others may be necessary for this level of analysis.

Level 3 Analysis – A HAZUS-MH analysis that yields the most accurate estimate of loss and typically requires the involvement of technical experts such as structural and geotechnical engineers who can modify loss parameters based on the specific conditions of a community. This level analysis will allow users to supply their own techniques to study special conditions such as dam breaks and tsunamis. Engineering and other expertise is needed at this level.

Lifelines – Critical facilities that include utility systems (potable water, wastewater, oil, natural gas, electric power facilities and communication systems) and transportation systems (airways, bridges, roads, tunnels and waterways).

Loss Estimation – The process of assigning hazard-related damage and loss estimates to inventory, infrastructure, lifelines, and population data. HAZUS-MH can estimate the economic and social loss for specific hazard occurrences. Loss estimation is essential to decision making at all levels of government and provides a basis for developing mitigation plans and policies. It also supports planning for emergency preparedness, response, and recovery.

Lowest Floor – Under the NFIP, the lowest floor of the lowest enclosed area (including basement) of a structure. For the HAZUS-MH flood model, this information can be used to assist in assessing the damage to buildings.

Magnitude – A measure of the strength of a hazard occurrence. The magnitude (also referred to as severity) of a given hazard occurrence is usually determined using technical measures specific to the hazard. For example, ranges of wind speeds are used to categorize tornados.

Major Disaster Declarations – Post-disaster status requested by a state's governor when local and state resources are not sufficient to meet disaster needs. It is based on the damage assessment, and an agreement to commit state funds and resources to the long-term recovery. The event must be clearly more than the state or local government can handle alone.

Mean Return Period (MRP) – The average period of time, in years, between occurrences of a particular hazard (equal to the inverse of the annual frequency of exceedance).

Mitigation Actions – Specific actions that help you achieve your goals and objectives.

Mitigation Goals – General guidelines that explain what you want to achieve. They are usually broad policy-type statements, long term, and represent global visions.

Mitigation Objectives – Strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific and measurable.

Mitigation Plan – A plan that documents the process used for a systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in a state or community. The plan includes a description of actions to minimize future vulnerability to hazards. This plan should be developed with local experts and significant community involvement.

National Flood Insurance Program (NFIP) – Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 Code of Federal Regulations (CFR) §60.3.

National Weather Service (NWS) – Organization that prepares and issues flood, severe weather, and coastal storm warnings and can provide technical assistance to Federal and state entities in preparing weather and flood warning plans.

Objectives – Objectives define strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific and measurable.

Occupancy Classes – Categories of buildings used by HAZUS-MH (for example, commercial, residential, industrial, government, and "other").

Ordinance – A term for a law or regulation adopted by local government.

Outflow – Associated with coastal hazards and follows water inundation creating strong currents that rip at structures and pound them with debris, and erode beaches and coastal structures
.

Parametric Model – A model relating to or including the evaluation of parameters. For example, HAZUS-MH uses parametric models that address different parameters for hazards such as earthquake, flood and wind (hurricane). For example, parameters considered for the earthquake hazard include soil type, peak ground acceleration, building construction type and other parameters.

Pilot Project – In this case, a project sponsored by FEMA to support the implementation of studies conducted in coordination with communities. The project focuses on demonstrating the value and benefits of using HAZUS-MH for the risk assessment portion of all-hazard mitigation plans required by the Disaster Mitigation Act of 2000. The projects demonstrate the value of using HAZUS-MH to evaluate, and analyze natural hazards that a number of state and local communities might address in their planning process. The pilot projects demonstrate that HAZUS-MH can provide defensible cost and loss estimates using the engineering and scientific risk calculations included in the software.

Planimetric – Maps that indicate only man-made features like buildings.

Planning – The act or process of making or carrying out plans; the establishment of goals, policies and procedures for a social or economic unit.

Post-disaster mitigation – Mitigation actions taken after a disaster has occurred, usually during recovery and reconstruction.

Presidential Disaster Declaration – A post-disaster status that puts into motion long-term federal recovery programs, some of which are matched by state programs, and designed to help disaster victims, businesses, and public entities in the areas of human services, public assistance (infrastructure support), and hazard mitigation. If declared, funding comes from the President's Disaster Relief Fund and disaster aid programs of other participating federal agencies.

Preparedness – Actions that strengthen the capability of government, citizens, and communities to respond to disasters.

Priority Hazards – Hazards considered most likely to impact a community based on frequency, severity, or other factors such as public perception. These are identified using available data and local knowledge.

Provided Data – The databases included in the HAZUS-MH software that allow users to run a preliminary analysis without collecting or using local data.

Probability – A statistical measure of the likelihood that a hazard event will occur.

Public education and outreach programs – Any campaign to make the public more aware of hazard mitigation and mitigation programs, including hazard information centers, mailings, public meetings, etc.

Q3 Flood Zone Data – FEMA flood data that delineate the 100- and 500-year flood boundaries. The Q3 Flood Data are digital representations of certain features of FEMA's Flood Insurance Rate Map (FIRM) product, intended for use with desktop mapping and GIS technology.

Recovery – The actions taken by an individual or community after a catastrophic event to restore order and lifelines in the community.

Regulation – Most states have granted local jurisdictions broad regulatory powers to enable the enactment and enforcement of ordinances that deal with public health, safety, and welfare. These include building codes, building inspections, zoning, floodplain and subdivision ordinances, and growth management initiatives.

Recurrence Interval – The average time between the occurrences of hazardous events of similar size in a given location. This interval is based on the probability that the given event will be equaled or exceeded in any given year.

Repetitive Loss Property – A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1,000 each have been paid within any 10-year period since 1978.

Replacement Value – The cost of rebuilding a structure. This cost is usually expressed in terms of cost per square foot and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality.

Resolutions – Expressions of a governing body's opinion, will, or intention that can be executive or administrative in nature. Most planning documents must undergo a council resolution, which must be supported in an official vote by a majority of representatives to be adopted. Other methods of making a statement or announcement about a particular issue or topic include proclamations or declarations.

Resources – Resources include the people, materials, technologies, money, etc., required to implement strategies or processes. The costs of these resources are often included in a budget.

Risk – The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Risk Assessment – A methodology used to assess potential exposure and estimated losses associated with priority hazards. The risk assessment process includes four steps: (1) identifying hazards, (2) profiling hazards, (3) conducting an inventory of assets, and (4) estimating losses. This pilot project report documents this process for selected hazards addressed as part of the pilot project.

Risk Factors – Characteristics of a hazard that contribute to the severity of potential losses in the study area.

Riverine – Of or produced by a river (for example, a riverine flood is one that is caused by a river overflowing its banks).

Scale – A proportion used in determining a dimensional relationship; the ratio of the distance between two points on a map and the actual distance between the two points on the earth's surface.

Scour – Removal of soil or fill material by the flow of floodwaters. This term is frequently used to describe storm-induced, localized, conical erosion around pilings and other foundation supports where the obstruction of flow increases turbulence.

Special Facility – A facility of special importance to a particular community. For the Village of Briarcliff Manor risk assessment, this category includes [TBD].

Special Flood Hazard Area (SFHA) – An area within a floodplain having a 1-percent or greater chance of flood occurrence in any given year (that is, the 100-year or base flood zone); represented on FIRMS as darkly shaded areas with zone designations that include the letter "A" or "V."

Stafford Act – The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law (PL) 100-107 was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, PL 93-288. The Stafford Act is the statutory authority for most Federal disaster response activities, especially as they pertain to FEMA and its programs.

Stakeholder – Stakeholders are individuals or groups, including businesses, private organizations, and citizens, that will be affected in any way by an action or policy.

State Hazard Mitigation Officer (SHMO) – The representative of state government who is the primary point of contact with FEMA, other state and Federal agencies, and local units of government in the planning and implementation of pre- and post-disaster mitigation activities.

Structure – Something constructed (for example, a residential or commercial building).

Study Area – The geographic unit for which data is collected and analyzed. A study area can be any combination of states, counties, cities, census tracts, or census blocks. The study area definition depends on the purpose of the loss study and in many cases will follow political boundaries or jurisdictions such as city limits.

Substantial Damage – Damage of any origin sustained by a structure in a SFHA, for which the cost of restoring the structure to its pre-hazard event condition would equal or exceed 50 percent of its pre-hazard event market value.

Topographic – Map that shows natural features and indicate the physical shape of the land using contour lines based on land elevation. These maps also can include man-made features (such as buildings and roads).

Tornado – A violently rotating column of air extending from a thunderstorm to the ground.

Transportation Systems – One of the lifeline system categories. This category includes: airways (airports, heliports, highways), bridges, tunnels, roadbeds, overpasses, transfer centers; railways (tracks, tunnels, bridges, rail yards, depots), and waterways (canals, locks, seaports, ferries, harbors, dry docks, piers).

Utility Systems – One of the lifeline systems categories. This category includes potable water, wastewater, oil, natural gas, electric power facilities and communication systems.

Vulnerability – Description of how exposed or susceptible an asset is to damage. This value depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power. If an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct affects.

Vulnerability Assessment – Evaluation of the extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard occurrences on the existing and future built environment.

Watershed – Area of land that drains down gradient (from areas of higher land to areas of lower land) to the lowest point; a common drainage basin. The water moves through a network of drainage pathways, both underground and on the surface. Generally, these pathways converge into streams and rivers, which become progressively larger as the water moves downstream, eventually reaching an estuary, lake, or ocean.

Wildfire – An uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.

Windstorm – A storm characterized by high wind velocities.

Zone – A geographical area shown on a National FIRM that reflects the severity or type of flooding in the area.

Zoning Ordinance – Designation of allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

APPENDIX D – PUBLIC PARTICIPATION QUESTIONNAIRE RESULTS

Questionnaire

Total Questionnaires Returned _____

Summary of Responses
Note: Not all questions were answered by each respondent; therefore the percentage presented has been calculated based on the number of respondents that answered the specific question and not the overall number of questionnaires received.

1. In the past 5 years, have you or someone in your household / business experienced a natural disaster such as a flood, earthquake, winter storm, severe windstorm, wildfire, or other type of natural disaster?

   Yes
   No

   1.1 If yes to question 1, which of the following types of natural hazard events have you or someone in your household experienced? *(Please choose all that apply.)*

   Drought
   Earthquake
   Flood
   Wildfire
   Household Fire
   Wind Storm
   Winter Storm
   Other _____

2. How concerned are you personally about the following disasters affecting the City of White Plains? *(Please check the appropriate level of concern.)*

Natural Disasters	Extremely Concerned	Very Concerned	Concerned	Somewhat Concerned	Not Concerned
Drought					
Earthquake					
Flood					
Wildfire					
Household Fire					
Wind Storm					
Winter Storm					
Other_____					

3. Have you ever received information about how to make your family / home / business safer from natural disasters?

Yes
No

3.1. If Yes, how recently?

Within Last 6 months
Between 6 and 12 months
Between 1 and 2 years
Between 2 and 5 years
5 years or more

3.2 From whom did you last receive information about how to make your family / home / business safer from natural disasters? *(Please choose only one.)*

News Media
City of White Plains
Insurance Agent or Company
Utility Company
Westchester County Department of Emergency Services
American Red Cross
Other non-profit organization
FEMA
Not Sure
Other _____

4. Who would you most trust to provide you with information about how to make your family / home / business safer from natural disasters? *(Please choose all that apply.)*

News Media
City of White Plains
Insurance Agent or Company
Utility Company
Westchester County Department of Emergency Services
American Red Cross
Other non-profit organization
FEMA
Not Sure
Other _____

5. What is the most effective way for you to receive information about how to make your family / home / business safer from natural disasters? *(Please choose all that apply.)*

Newspaper Stories / Ads
Television News / Ads
Radio News / Ads
Schools
Outdoor Advertisement
Books
Mail
Fire Department / Police Department
Internet / City of White Plains Website
"Code Red" Phone Announcements
Fact Sheet / Brochure
White Plains B.I.D.
Public Workshop / Meeting
Magazine
Academic Institutions
Other _____

6. To assist in communicating information about how to better prepare for a natural disaster, which of the following phrases do you think is the easiest to understand? *(Please choose only one.)*

Natural disaster readiness
Disaster preparedness
Emergency preparedness
Natural hazard risk reduction
Other _____

Preparedness Activities In Your Household

7. In the following list, please check those activities that you have done in your household, plan to do in the near future, have not done, or are unable to do. *(Please check the appropriate box.)*

In your household**,** have you or someone in your household:

Preparedness Activity	Have Done	Plan to Do	Not Done	Unable to Do Explain Why
Attended meetings or received written information on natural disasters or emergency preparedness?				
Talked with members in your household about what to do in case of a natural disaster or emergency?				
Developed a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a household emergency?				
Prepared a "Disaster Supply Kit" (stored extra food, water, batteries, or other emergency supplies)?				
In the last year, has anyone in your household trained in first aid, or CPR?				
Installed gasoline or natural gas fueled generator with an automatic transfer switch?				
Waterproofed your basement floor and walls and/or added sump pumps with back-up power supply?				

8. Building a disaster supply kit, receiving first aid training and developing a family / household or business emergency plan are inexpensive activities that require a personal time commitment. How much time (per year) are you willing to spend on preparing yourself / household / business for a natural disaster or emergency event? *(Please choose only one.)*

0-1 hour
2-3 hours
4-7 hours
8-15 hours
16+ hours

9. What steps, if any, have you or someone in your household taken to prepare for a natural disaster? *(Please choose all that apply.)*

Non-Perishable Food
Water
Candles
Waterproof Matches
Flashlight(s)
Batteries
Battery Powered Radio
Reserve Supply of Cash
Medical Supplies (First Aid Kit)
Fire Extinguisher
Smoke Detector on each level of the house
Prepared a Disaster Supply Kit
Received First Aid / CPR Training
Made a Fire Escape Plan
Developed a Reconnection Plan (where to go and who to call)
Discussed Utility Shutoffs
Other _____

10. Does your household or business have insurance coverage for floods?

Yes
No

10.1 If "No", what is the main reason your household does not have insurance for flood events?

Not located in floodplain
Too expensive
Not necessary
Never considered it
Deductibles too high / not worth it
Not familiar with it / don't know about it
Other _____

11. Does your household or business have insurance coverage for natural hazards / disasters / storm related events?

    Not available
    Too expensive
    Not necessary
    Never considered it
    Deductibles too high / not worth it
    Not familiar with it / don't know about it
    Other _____

Natural Hazard Risk Reduction

12. Did you consider the possible occurrence of a natural hazard / disaster including flooding, when you bought or moved into your current home or business?

    Yes
    No

13. Would you be willing to spend more money on a home or business that had features that made it more hazard / disaster resistant?

    Yes
    No

14. How much more money are you willing to spend to better protect your family and home or business from natural hazards / disasters? *(Please choose only one.)*

    $5,000 and above
    $2,500 - $4,999
    $1,000 - $2,499
    $500 - $999
    $100 - $499
    Less than $100
    Nothing
    Don't Know

15. What non-structural and structural modifications for earthquakes have you made to your home or business?

Non-Structural

Anchor bookcases and cabinets to walls
Secure water heater to wall
Install latches on drawers / cabinets
Fit gas appliances with flexible connections
None
Other _____

Structural

Secure home to foundation
Brace inside of cripple wall with sheathing
Brace un-reinforced chimney
Brace un-reinforced masonry and concrete walls and foundation
None
Other _____

16. Which of the following incentives, if any, would motivate you to take additional steps to better protect your family / home / business from a natural hazard / disaster ? *(Please choose all that apply.)*

Insurance discount
Low interest rate loan
Lower new home construction costs
Mortgage discount
Tax break or incentive
None
Other _____

******Please Note: The Following Questions Are Optional******

General Owner / Occupant Information

17. Age:

Between 18 and 30 years of age
Between 31 and 40 years of age
Between 41 and 50 years of age
Between 51 and 60 years of age
Between 61 and 64 years of age
Over 65 years of age

18. Gender:

Male
Female

19. Please indicate your level of education

Grade School / No Education
Some High School
High School Graduate / GED
Some College / Trade School
College Degree
Postgraduate Degree
Other _____

20. Zip Code

10601
10603
10604
10605
10606

21. Neighborhood Association

Battle Hill	Highlands
Bryant Gardens	Hillair Circle
Carhart	Idle Forest
Colonial Corners	North Broadway
Downtown	North Street
Eastview	Old Mamaroneck Rd
Ferris Ave	Old Oak Ridge
Fisher Hill	Prospect Park
Fulton Street	Prospect Park
Gedney Circle	Reynal Park/Rocky Dell
Gedney Farms	Rosedale
Gedney Manor	Saxon Wood
Gedney Meadows/Holbrooke	Soundview
Gedney Park	Westminster Ridge
Havilands Manor	Woodcrest Heights

Don’t Know ____

22. How long have you lived or owned a business in the City of White Plains?

Less than 1 year
1-5 years
5-9 years
10-19 years
20 years or more

23. If you lived or owned a business in White Plains less than 20 years, where did you live before you moved to White Plains?

_____

24. Do you have access to the Internet?

Yes
No

25. Do you own or rent your home or business?

Rent
Own

26. Do you own / rent a:

Single Family Home
Duplex
Apartment (3-4 units in structure)
Apartment (5 or more units in structure)
Condominium / Town House
Single Unit Business
Building with more than 1 business
Other _____

APPENDIX E – FEDERAL REGULATIONS - EMERGENCY MANAGEMENT AND ASSISTANCE

Title 44: Emergency Management and Assistance

PART 201—MITIGATION PLANNING

Section Contents

Authority: Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121 through 5207; Reorganization Plan No. 3 of 1978, 43 FR 41943, 3 CFR, 1978 Comp., p. 329; Homeland Security Act of 2002, 6 U.S.C. 101; E.O. 12127, 44 FR 19367, 3 CFR, 1979 Comp., p. 376; E.O. 12148, 44 FR 43239, 3 CFR, 1979 Comp., p. 412; E.O. 13286, 68 FR 10619, 3 CFR, 2003 Comp., p. 166.

Source: 67 FR 8848, Feb. 26, 2002, unless otherwise noted.

§ 201.1 Purpose.

(a) The purpose of this part is to provide information on the polices and procedures for mitigation planning as required by the provisions of section 322 of the Stafford Act, 42 U.S.C. 5165.

(b) The purpose of mitigation planning is for State, local, and Indian tribal governments to identify the natural hazards that impact them, to identify actions and activities to reduce any losses from those hazards, and to establish a coordinated process to implement the plan, taking advantage of a wide range of resources.

§ 201.2 Definitions.

Administrator means the head of the Federal Emergency Management Agency, or his/her designated representative.

Flood Mitigation Assistance (FMA) means the program authorized by section 1366 of the National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4104c, and implemented at parts 78 and 79.

Grantee means the government to which a grant is awarded, which is accountable for the use of the funds provided. The grantee is the entire legal entity even if only a particular component of the entity is designated in the grant award document. Generally, the State is the grantee. However, after a declaration, an Indian tribal government may choose to be a grantee, or may act as a subgrantee under the State. An Indian tribal government acting as grantee will assume the responsibilities of a "state", as described in this part, for the purposes of administering the grant.

Hazard mitigation means any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.

Hazard Mitigation Grant Program (HMGP) means the program authorized under section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5170c, and implemented at part 206, subpart N of this chapter.

Indian Tribal government means any Federally recognized governing body of an Indian or Alaska Native Tribe, band, nation, pueblo, village, or community that the Secretary of Interior acknowledges to exist as an Indian Tribe under the Federally Recognized Indian Tribe List Act of 1994, 25 U.S.C. 479a. This does not include Alaska Native corporations, the ownership of which is vested in private individuals.

Local government is any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

Managing State means a State to which FEMA has delegated the authority to administer and manage the HMGP under the criteria established by FEMA pursuant to 42 U.S.C. 5170c(c). FEMA may also delegate authority to tribal governments to administer and manage the HMGP as a Managing State.

Pre-Disaster Mitigation Program (PDM) means the program authorized under section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5133.

Regional Administrator means the head of a Federal Emergency Management Agency regional office, or his/her designated representative.

Repetitive Flood Claims (RFC) program means the program authorized under section 1323 of the National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4011, which provides funding to reduce flood damages to individual properties for which 1 or more claim payments for losses have been made under flood insurance coverage and that will result in the greatest savings to the National Flood Insurance Program (NFIP) in the shortest period of time.

Severe Repetitive Loss (SRL) program means the program authorized under section 1361(a) of the National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4102a, and implemented at part 79 of this chapter.

Severe Repetitive Loss properties are defined as single or multifamily residential properties that are covered under an NFIP flood insurance policy and:

(1) That have incurred flood-related damage for which 4 or more separate claims payments have been made, with the amount of each claim (including building and contents payments) exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or

(2) For which at least 2 separate claims payments (building payments only) have been made under such coverage, with cumulative amount of such claims exceeding the market value of the property.

(3) In both instances, at least 2 of the claims must be within 10 years of each other, and claims made within 10 days of each other will be counted as 1 claim.

Small and impoverished communities means a community of 3,000 or fewer individuals that is identified by the State as a rural community, and is not a remote area within the corporate boundaries of a larger city; is economically disadvantaged, by having an average per capita annual income of residents not exceeding 80 percent of national, per capita income, based on best available data; the local unemployment rate exceeds by one percentage point or more, the most recently reported, average yearly national unemployment rate; and any other factors identified in the State Plan in which the community is located.

The Stafford Act refers to the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93–288, as amended (42 U.S.C. 5121–5206).

State is any State of the United States, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.

State Hazard Mitigation Officer is the official representative of State government who is the primary point of contact with FEMA, other Federal agencies, and local governments in mitigation planning and implementation of mitigation programs and activities required under the Stafford Act.

Subgrantee means the government or other legal entity to which a subgrant is awarded and which is accountable to the grantee for the use of the funds provided. Subgrantees can be a State agency, local government, private non-profit organizations, or Indian tribal government. Indian tribal governments acting as a subgrantee are accountable to the State grantee.

[67 FR 8848, Feb. 26, 2002, as amended at 72 FR 61747, Oct. 31, 2007; 74 FR 15344, Apr. 3, 2009; 74 FR 47481, Sept. 16, 2009]

§ 201.3 Responsibilities.

(a) *General.* This section identifies the key responsibilities of FEMA, States, and local/tribal governments in carrying out section 322 of the Stafford Act, 42 U.S.C. 5165.

(b) *FEMA.* The key responsibilities of the Regional Administrator are to:

(1) Oversee all FEMA related pre- and post-disaster hazard mitigation programs and activities;

(2) Provide technical assistance and training to State, local, and Indian tribal governments regarding the mitigation planning process;

(3) Review and approve all Standard and Enhanced State Mitigation Plans;

(4) Review and approve all local mitigation plans, unless that authority has been delegated to the State in accordance with §201.6(d);

(5) Conduct reviews, at least once every three years, of State mitigation activities, plans, and programs to ensure that mitigation commitments are fulfilled, and when necessary, take action, including recovery of funds or denial of future funds, if mitigation commitments are not fulfilled.

(c) *State.* The key responsibilities of the State are to coordinate all State and local activities relating to hazard evaluation and mitigation and to:

(1) Prepare and submit to FEMA a Standard State Mitigation Plan following the criteria established in §201.4 as a condition of receiving non-emergency Stafford Act assistance and FEMA mitigation grants. In addition, a State may choose to address severe repetitive loss properties in their plan as identified in §201.4(c)(3)(v) to receive the reduced cost share for the Flood Mitigation Assistance (FMA) and Severe Repetitive Loss (SRL) programs, pursuant to §79.4(c)(2) of this chapter.

(2) In order to be considered for the 20 percent HMGP funding, prepare and submit an Enhanced State Mitigation Plan in accordance with §201.5, which must be reviewed and updated, if necessary, every three years from the date of the approval of the previous plan.

(3) At a minimum, review and update the Standard State Mitigation Plan every 3 years from the date of the approval of the previous plan in order to continue program eligibility.

(4) Make available the use of up to the 7 percent of HMGP funding for planning in accordance with §206.434.

(5) Provide technical assistance and training to local governments to assist them in applying for HMGP planning grants, and in developing local mitigation plans.

(6) For Managing States that have been approved under the criteria established by FEMA pursuant to 42 U.S.C. 5170c(c), review and approve local mitigation plans in accordance with §201.6(d).

(d) *Local governments.* The key responsibilities of local governments are to:

(1) Prepare and adopt a jurisdiction-wide natural hazard mitigation plan as a condition of receiving project grant funds under the HMGP, in accordance with §201.6.

(2) At a minimum, review and update the local mitigation plan every 5 years from date of plan approval of the previous plan in order to continue program eligibility.

(e) *Indian tribal governments.* The key responsibilities of the Indian tribal government are to coordinate all tribal activities relating to hazard evaluation and mitigation and to:

(1) Prepare and submit to FEMA a Tribal Mitigation Plan following the criteria established in §201.7 as a condition of receiving non-emergency Stafford Act assistance as a grantee. This plan will also allow Indian tribal governments to apply through the State, as a subgrantee, for any FEMA mitigation project grant. Indian tribal governments with a plan approved by FEMA on or before October 1, 2008 under §201.4 or §201.6 will also meet this planning requirement. All Tribal Mitigation Plans approved after that date must follow the criteria identified in §201.7. In addition, an Indian Tribal government applying to FEMA as a grantee may choose to address severe repetitive loss properties as identified in §201.4(c)(3)(v) as a condition of receiving the reduced cost share for the FMA and SRL programs, pursuant to §79.4(c)(2) of this chapter.

(2) Review and update the Tribal Mitigation Plan at least every 5 years from the date of approval of the previous plan in order to continue program eligibility.

(3) In order to be considered for the increased HMGP funding, the Tribal Mitigation Plan must meet the Enhanced State Mitigation Plan criteria identified in §201.5. The plan must be reviewed and updated at least every 3 years from the date of approval of the previous plan.

[67 FR 8848, Feb. 26, 2002, as amended at 67 FR 61515, Oct. 1, 2002; 69 FR 55096, Sept. 13, 2004; 72 FR 61748, Oct. 31, 2007; 74 FR 47482, Sept. 16, 2009]

§ 201.4 Standard State Mitigation Plans.

(a) *Plan requirement.* States must have an approved Standard State Mitigation Plans meeting the requirements of this section as a condition of receiving non-emergency Stafford Act assistance and FEMA mitigation grants. Emergency assistance provided under 42 U.S.C. 5170a, 5170b, 5173, 5174, 5177, 5179, 5180, 5182, 5183, 5184, 5192 will not be affected. Mitigation planning grants provided through the Pre-disaster Mitigation (PDM) program, authorized under section 203 of the Stafford Act, 42 U.S.C. 5133, will also continue to be available. The mitigation plan is the demonstration of the State's commitment to reduce risks from natural hazards and serves as a guide for State decision makers as they commit resources to reducing the effects of natural hazards.

(b) *Planning process.* An effective planning process is essential in developing and maintaining a good plan. The mitigation planning process should include coordination with other State agencies, appropriate Federal agencies, interested groups, and be integrated to the extent possible with other ongoing State planning efforts as well as other FEMA mitigation programs and initiatives.

(c) *Plan content.* To be effective the plan must include the following elements:

(1) Description of the *planning process* used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated.

(2) *Risk assessments* that provide the factual basis for activities proposed in the strategy portion of the mitigation plan. Statewide risk assessments must characterize and analyze natural hazards and risks to provide a statewide overview. This overview will allow the State to compare potential losses throughout the State and to determine their priorities for implementing mitigation measures under the strategy, and to prioritize jurisdictions for receiving technical and financial support in developing more detailed local risk and vulnerability assessments. The risk assessment shall include the following:

(i) An overview of the type and location of all natural hazards that can affect the State, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate;

(ii) An overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments as well as the State risk assessment. The State shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. State owned or operated critical facilities located in the identified hazard areas shall also be addressed;

(iii) An overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas.

(3) A *Mitigation Strategy* that provides the State's blueprint for reducing the losses identified in the risk assessment. This section shall include:

(i) A description of State goals to guide the selection of activities to mitigate and reduce potential losses.

(ii) A discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: an evaluation of State laws, regulations, policies, and programs related to hazard mitigation as well as to development in hazard-prone areas; a discussion of State funding capabilities for hazard mitigation projects; and a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.

(iii) An identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy. This section should be linked to local plans, where specific local actions and projects are identified.

(iv) Identification of current and potential sources of Federal, State, local, or private funding to implement mitigation activities.

(v) A State may request the reduced cost share authorized under §79.4(c)(2) of this chapter for the FMA and SRL programs, if it has an approved State Mitigation Plan meeting the requirements of this section that also identifies specific actions the State has taken to reduce the number of repetitive loss properties (which must include severe repetitive loss properties), and specifies how the State intends to reduce the number of such repetitive loss properties. In addition, the plan must describe the strategy the State has to ensure that local jurisdictions with severe repetitive loss properties take actions to reduce the number of these properties, including the development of local mitigation plans.

(4) A section on the *Coordination of Local Mitigation Planning* that includes the following:

(i) A description of the State process to support, through funding and technical assistance, the development of local mitigation plans.

(ii) A description of the State process and timeframe by which the local plans will be reviewed, coordinated, and linked to the State Mitigation Plan.

(iii) Criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which should include consideration for communities with the highest risks, repetitive loss properties, and most intense development pressures. Further, that for non-planning grants, a principal criterion for prioritizing grants shall be the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs.

(5) A *Plan Maintenance Process* that includes:

(i) An established method and schedule for monitoring, evaluating, and updating the plan.

(ii) A system for monitoring implementation of mitigation measures and project closeouts.

(iii) A system for reviewing progress on achieving goals as well as activities and projects identified in the Mitigation Strategy.

(6) A *Plan Adoption Process*. The plan must be formally adopted by the State prior to submittal to us for final review and approval.

(7) *Assurances.* The plan must include assurances that the State will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c) of this chapter. The State will amend its plan whenever necessary to reflect changes in State or Federal statutes and regulations as required in 44 CFR 13.11(d) of this chapter.

(d) *Review and updates.* Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval to the appropriate Regional Administrator every three years. The Regional review will be completed within 45 days after receipt from the State, whenever possible. We also encourage a State to review its plan in the post-disaster timeframe to reflect changing priorities, but it is not required.

[67 FR 8848, Feb. 26, 2002, as amended at 67 FR 61515, Oct. 1, 2002; 69 FR 55096, Sept. 13, 2004; 72 FR 61565, 61738, Oct. 31, 2007]

§ 201.5 Enhanced State Mitigation Plans.

(a) A State with a FEMA approved Enhanced State Mitigation Plan at the time of a disaster declaration is eligible to receive increased funds under the HMGP, based on twenty percent of the total estimated eligible Stafford Act disaster assistance. The Enhanced State Mitigation Plan must demonstrate that a State has developed a comprehensive mitigation program, that the State effectively uses available mitigation funding, and that it is capable of managing the increased funding. In order for the State to be eligible for the 20 percent HMGP funding, FEMA must have approved the plan within three years prior to the disaster declaration.

(b) Enhanced State Mitigation Plans must include all elements of the Standard State Mitigation Plan identified in §201.4, as well as document the following:

(1) Demonstration that the plan is integrated to the extent practicable with other State and/or regional planning initiatives (comprehensive, growth management, economic development, capital improvement, land development, and/or emergency management plans) and FEMA mitigation programs and initiatives that provide guidance to State and regional agencies.

(2) Documentation of the State's project implementation capability, identifying and demonstrating the ability to implement the plan, including:

(i) Established eligibility criteria for multi-hazard mitigation measures.

(ii) A system to determine the cost effectiveness of mitigation measures, consistent with OMB Circular A–94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs, and to rank the measures according to the State's eligibility criteria.

(iii) Demonstration that the State has the capability to effectively manage the HMGP as well as other mitigation grant programs, including a record of the following:

(A) Meeting HMGP and other mitigation grant application timeframes and submitting complete, technically feasible, and eligible project applications with appropriate supporting documentation;

(B) Preparing and submitting accurate environmental reviews and benefit-cost analyses;

(C) Submitting complete and accurate quarterly progress and financial reports on time; and

(D) Completing HMGP and other mitigation grant projects within established performance periods, including financial reconciliation.

(iv) A system and strategy by which the State will conduct an assessment of the completed mitigation actions and include a record of the effectiveness (actual cost avoidance) of each mitigation action.

(3) Demonstration that the State effectively uses existing mitigation programs to achieve its mitigation goals.

(4) Demonstration that the State is committed to a comprehensive state mitigation program, which might include any of the following:

(i) A commitment to support local mitigation planning by providing workshops and training, State planning grants, or coordinated capability development of local officials, including Emergency Management and Floodplain Management certifications.

(ii) A statewide program of hazard mitigation through the development of legislative initiatives, mitigation councils, formation of public/private partnerships, and/or other executive actions that promote hazard mitigation.

(iii) The State provides a portion of the non-Federal match for HMGP and/or other mitigation projects.

(iv) To the extent allowed by State law, the State requires or encourages local governments to use a current version of a nationally applicable model building code or standard that addresses natural hazards as a basis for design and construction of State sponsored mitigation projects.

(v) A comprehensive, multi-year plan to mitigate the risks posed to existing buildings that have been identified as necessary for post-disaster response and recovery operations.

(vi) A comprehensive description of how the State integrates mitigation into its post-disaster recovery operations.

(c) *Review and updates.* (1) A State must review and revise its plan to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities, and resubmit it for approval to the appropriate Regional Administrator every three years. The Regional review will be completed within 45 days after receipt from the State, whenever possible.

(2) In order for a State to be eligible for the 20 percent HMGP funding, the Enhanced State Mitigation plan must be approved by FEMA within the three years prior to the current major disaster declaration.

§ 201.6 Local Mitigation Plans.

The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the State to provide technical assistance and to prioritize project funding.

(a) *Plan requirements.* (1) A local government must have a mitigation plan approved pursuant to this section in order to receive HMGP project grants. The Administrator may, at his discretion, require a local mitigation plan for the Repetitive Flood Claims Program. A local government must have a mitigation plan approved pursuant to this section in order to apply for and receive mitigation project grants under all other mitigation grant programs.

(2) Plans prepared for the FMA program, described at part 79 of this chapter, need only address these requirements as they relate to flood hazards in order to be eligible for FMA project grants. However, these plans must be clearly identified as being flood mitigation plans, and they will not meet the eligibility criteria for other mitigation grant programs, unless flooding is the only natural hazard the jurisdiction faces.

(3) Regional Administrator's may grant an exception to the plan requirement in extraordinary circumstances, such as in a small and impoverished community, when justification is provided. In these cases, a plan will be completed within 12 months of the award of the project grant. If a plan is not provided within this timeframe, the project grant will be terminated, and any costs incurred after notice of grant's termination will not be reimbursed by FEMA.

(4) Multi-jurisdictional plans (*e.g.* watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan. State-wide plans will not be accepted as multi-jurisdictional plans.

(b) *Planning process.* An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and

(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

(c) *Plan content.* The plan shall include the following:

(1) Documentation of the *planning process* used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

(2) A *risk assessment* that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. The risk assessment shall include:

(i) A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

(ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:

(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;

(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate;

(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

(iii) For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

(3) *A mitigation strategy* that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section shall include:

(i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

(ii) A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

(iii) An action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

(iv) For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

(4) A *plan maintenance process* that includes:

(i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

(ii) A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

(iii) Discussion on how the community will continue public participation in the plan maintenance process.

(5) *Documentation* that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

(d) *Plan review.* (1) Plans must be submitted to the State Hazard Mitigation Officer (SHMO) for initial review and coordination. The State will then send the plan to the appropriate FEMA Regional Office for formal review and approval. Where the State point of contact for the FMA program is different from the SHMO, the SHMO will be responsible for coordinating the local plan reviews between the FMA point of contact and FEMA.

(2) The Regional review will be completed within 45 days after receipt from the State, whenever possible.

(3) A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

(4) Managing States that have been approved under the criteria established by FEMA pursuant to 42 U.S.C. 5170c(c) will be delegated approval authority for local mitigation plans, and the review will be based on the criteria in this part. Managing States will review the plans within 45 days of receipt of the plans, whenever possible, and provide a copy of the approved plans to the Regional Office.

[67 FR 8848, Feb. 26, 2002, as amended at 67 FR 61515, Oct. 1, 2002; 68 FR 61370, Oct. 28, 2003; 69 FR 55096, Sept. 13, 2004; 72 FR 61748, Oct. 31, 2007 ; 74 FR 47482, Sept. 16, 2009]

§ 201.7 Tribal Mitigation Plans.

The Indian Tribal Mitigation Plan is the representation of the Indian tribal government's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards.

(a) *Plan requirement.* (1) Indian tribal governments applying to FEMA as a grantee must have an approved Tribal Mitigation Plan meeting the requirements of this section as a condition of receiving non-emergency Stafford Act assistance and FEMA mitigation grants. Emergency assistance provided under 42 U.S.C. 5170a, 5170b, 5173, 5174, 5177, 5179, 5180, 5182, 5183, 5184, 5192 will not be affected. Mitigation planning grants provided through the PDM program, authorized under section 203 of the Stafford Act, 42 U.S.C. 5133, will also continue to be available.

(2) An Indian Tribal government applying to FEMA as a grantee may choose to address severe repetitive loss properties in their plan, as identified in §201.4(c)(3)(v), to receive the reduced cost share for the FMA and SRL programs.

(3) Indian Tribal governments applying through the State as a subgrantee must have an approved Tribal Mitigation Plan meeting the requirements of this section in order to receive HMGP project grants and, the Administrator, at his discretion may require a Tribal Mitigation Plan for the Repetitive Flood Claims Program. A Tribe must have an approved Tribal Mitigation Plan in order to apply for and receive FEMA mitigation project grants, under all other mitigation grant programs. The provisions in §201.6(a)(3) are available to Tribes applying as subgrantees.

(4) Multi-jurisdictional plans (*e.g.* county-wide or watershed plans) may be accepted, as appropriate, as long as the Indian tribal government has participated in the process and has officially adopted the plan. Indian tribal governments must address all the elements identified in this section to ensure eligibility as a grantee or as a subgrantee.

(b) An effective planning process is essential in developing and maintaining a good plan. The mitigation planning process should include coordination with other tribal agencies, appropriate Federal agencies, adjacent jurisdictions, interested groups, and be integrated to the extent possible with other ongoing tribal planning efforts as well as other FEMA mitigation programs and initiatives.

(c) *Plan content.* The plan shall include the following:

(1) Documentation of the *planning process* used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved. This shall include:

(i) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval, including a description of how the Indian tribal government defined "public;"

(ii) As appropriate, an opportunity for neighboring communities, tribal and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process;

(iii) Review and incorporation, if appropriate, of existing plans, studies, and reports; and

(iv) Be integrated to the extent possible with other ongoing tribal planning efforts as well as other FEMA programs and initiatives.

(2) A *risk assessment* that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Tribal risk assessments must provide sufficient information to enable the Indian tribal government to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. The risk assessment shall include:

(i) A description of the type, location, and extent of all natural hazards that can affect the tribal planning area. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

(ii) A description of the Indian tribal government's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the tribe. The plan should describe vulnerability in terms of:

(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;

(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate;

(C) A general description of land uses and development trends within the tribal planning area so that mitigation options can be considered in future land use decisions; and

(D) Cultural and sacred sites that are significant, even if they cannot be valued in monetary terms.

(3) A *mitigation strategy* that provides the Indian tribal government's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section shall include:

(i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

(ii) A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

(iii) An action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the Indian Tribal government.

(iv) A discussion of the Indian tribal government's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: An evaluation of tribal laws, regulations, policies, and programs related to hazard mitigation as well as to development in hazard-prone areas; and a discussion of tribal funding capabilities for hazard mitigation projects.

(v) Identification of current and potential sources of Federal, tribal, or private funding to implement mitigation activities.

(vi) An Indian Tribal government applying to FEMA as a grantee may request the reduced cost share authorized under §79.4(c)(2) of this chapter of the FMA and SRL programs if they have an approved Tribal Mitigation Plan meeting the requirements of this section that also identifies actions the Indian Tribal government has taken to reduce the number of repetitive loss properties (which must include severe repetitive loss properties), and specifies how the Indian Tribal government intends to reduce the number of such repetitive loss properties.

(4) A *plan maintenance process* that includes:

(i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan.

(ii) A system for monitoring implementation of mitigation measures and project closeouts.

(iii) A process by which the Indian tribal government incorporates the requirements of the mitigation plan into other planning mechanisms such as reservation master plans or capital improvement plans, when appropriate.

(iv) Discussion on how the Indian tribal government will continue public participation in the plan maintenance process.

(v) A system for reviewing progress on achieving goals as well as activities and projects identified in the mitigation strategy.

(5) *Plan Adoption Process.* The plan must be formally adopted by the governing body of the Indian tribal government prior to submittal to FEMA for final review and approval.

(6) *Assurances.* The plan must include assurances that the Indian tribal government will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with §13.11(c) of this chapter. The Indian tribal government will amend its plan whenever necessary to reflect changes in tribal or Federal laws and statutes as required in §13.11(d) of this chapter.

(d) *Plan review and updates.* (1) Plans must be submitted to the appropriate FEMA Regional Office for formal review and approval. Indian tribal governments who would like the option of being a subgrantee under the State must also submit their plan to the State Hazard Mitigation Officer for review and coordination.

(2) The Regional review will be completed within 45 days after receipt from the Indian tribal government, whenever possible.

(3) Indian tribal governments must review and revise their plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for non-emergency Stafford Act assistance and FEMA mitigation grant funding, with the exception of the Repetitive Flood Claims program.

[72 FR 61749, Oct. 31, 2007, as amended at 74 FR 47482, Sept. 16, 2009]

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APPENDIX F – PLANNING COMMITTEE

The City of White Plains Hazard Mitigation Planning Committee Members

Name	Title	Affiliation
Joseph J. Nicoletti, Jr., P.E. (Committee Chair)	Commissioner of Public Works / City Engineer	City of White Plains
Thomas Roach	Mayor	City of White Plains
John Callahan	Chief of Staff / Corporation Counsel	City of White Plains
Damon Amadio	Commissioner of Building	City of White Plains
Michael Genito	Commissioner of Finance	City of White Plains
Elizabeth Cheteny	Commissioner of Planning	City of White Plains
David Chong	Commissioner of Public Safety	City of White Plains
John Larson	Commissioner of Parking	City of White Plains
Michael Coakley	Director of Information Services	City of White Plains
Rod Johnson	Environmental Officer	City of White Plains
Christopher Clouet	Superintendent	White Plains Public Schools
Todd Gordon (Gedney Manor)	Co-President	Council of Neighborhood Associations (CNA)
Bob Meyerson (Havilands Manor)	Co-President	Council of Neighborhood Associations (CNA)
Jay T. Pisco	Commissioner of Public Works	Westchester County
John Cullen Jr.	Commissioner of Emergency Services	Westchester County
Jennifer Wacha	Deputy Commissioner of Fire Services	Westchester County
George Longworth	Commissioner of Public Safety	Westchester County
Richard Lord	Chief of Mitigation Programs and Agency Preservation Officer	NYS Division of Homeland Security
Willie Janeway	NYS DEC Director Region 3	NYS DEC
Patrick Ferracane	Water Program Specials – Division of Water	NYS DEC
Alon Dominitz	Division of Water Dam Safety	NYS DEC
John Schandler	C.E.O.	White Plains Hospital
Kevin Dolan	Account Representative	NYPA
Charles Mayfield	Manager of Construction Services	Cablevision
Tim Andrews	Right of Way Manager	Verizon
Joe Salhab	TransCare Manager	TransCare
Carlos Torres	VP Emergency Storm Management	Con Edison
Mark Mannix	Manager of Government Relations	MTA

APPENDIX G – DATA SOURCES / REFERENCES FOR PLAN DEVELOPMENT

Source of Information (Level of Government / Private Sector)	Government Agency / Private Sector Business	Name of Document, Plan, Report, Data, Article, Press Release	Form of Document
Local	The City of White Plains	The City of White Plains Master Plan	Hard Copy On File in City Hall
Local	The City of White Plains	The City of White Plains Stormwater Management Plan	Hard Copy On File in City Hall
Local	The City of White Plains	The City of White Plains Zoning Regulations	Hard Copy On File in City Hall
Local	The City of White Plains	The City of White Plains Planning Regulations	Hard Copy On File in City Hall
Local	The City of White Plains	The City of White Plains Municipal Code	Website: www.cityofwhiteplains.com
Local	The City of White Plains	The City of White Plains Emergency Response Plan	Hard Copy On File in City Hall
Local	The City of White Plains	Department of Public Works Annual Pump Station Report, 2007	Hard Copy On File in City Hall
Local	The City of White Plains	The City of White Plains Comprehensive Plan Draft 2006	Hard Copy On File in City Hall
Local	The City of White Plains	FEMA FIRM Maps (Sept 2007)	Hard Copy On File in City Hall

Local	Westchester County	Department of Emergency Services Comprehensive Emergency Management Plan Version Nov 2005	Website: http://www.westchestergov.com/ EmergServ/reports/cemp2005.pdf
Local	Westchester County	Department of Planning Data Books 2010	Website: http://planning.westchestergov.com/ index.php?option=com_content&task =view&id=842&Itemid-1484
Local	City of New York	Department of Environmental Protection Kensico Dam Emergency Action Plan May 2009	Hard Copy On File in City Hall
Local	Westchester County	Geographic Information Systems Mapping	Website http://giswww.westchestergov.com/
Local	Westchester County	Department of Planning Drought Emergency Plan	Website http://planning.westchestergov.com/
Local	City of New York	Heat Emergency plan	Website http://www.nyc.gov/html/oem/html/hazards /heat_safety.shtml
Local	City of New York	Department of Environmental Protection History of Drought History and Water Consumption	Website http://www.nyc.gov/html/dep/html/drinking _water/droughtist.shtml
State	New York State Department of Environmental Conservation	Bureau of Flood Protection and Dam Safety - List of Dams	Website http:www.dec.state.ny.gov/pubs/42978.html

State/Academic	New York State Climate Office	Department of Earth and Atmospheric Science at Cornell University The Climate of New York Physical Description	Website http://nysc.eas.cornell.edu/climate_of_ny.html
State	New York State Department of Transportation	Highway Mileage Inventory	Website http://www/nysdot.gov/divisions/engineering/ technical-services/highway-data-services/ highway-mileage-summary
State	New York State Office of Emergency Management	New York State Hazard Mitigation Plan 2011	Website http://www.dhses.ny.gov/oem/mitigation/plan.cfm
Federal	Federal Emergency Management Agency	State and Local Mitigation Planning how to Guides 386-1 to 386-8	Hard Copy
Federal	Federal Emergency Management Agency	Local Multi-Hazard Mitigation Planning Guidance, July 1, 2008	Hard Copy
Federal	Federal Emergency Management Agency	Region II Mitigation Planning "Toolkit"	Website http://www.fema.gov/about/regions/regionii/ toolkit_table.shtml
Federal	Federal Emergency Management Agency	Listing of Federal Presidential Disaster Declarations	Website http://www.fema.gov/news/disasters_state. fema?id=36
Federal	Federal Emergency Management Agency	National Flood Insurance Program BureauNet (Loss Statistics)	Website http://bsa.nfipstst.com/reports/1040.htm#36
Federal	Federal Emergency Management Agency	National Flood Insurance Program Flood Zone Designations	Website http://www.fema.gov/business/nfip

Federal	Federal Emergency Management Agency	HAZUS-MH	Computer Data Program
Federal	Federal Emergency Management Agency	List of Repetitive Losses for Study Area	Hard Copy / CD
Federal	Census Bureau	Summary Files (SF3) Population, Social Characteristics, Ethnicity	Website http://factfinder.census.gov/servlet/DatasetMainPageSevlet?_ds_name=DEC_2000_SF3_U&_program=DEC&_Lang=en
Federal	Geological Survey	Natural Hazard-Floods	Website http://www.usgs.gov/themes/flood.html
Federal	Geological Survey National Oceanic and Atmospheric Administration	National Climate Data Center	Website http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/usa.shtml
Federal	National Oceanic and Atmospheric Administration	Historical Storm Data	Website http://www.spc.noaa.gov/climo/historical.html
Federal	National Oceanic and Atmospheric Administration	Coastal Services Center	Website http://www.csc.noaa.gov/
Federal	National Oceanic and Atmospheric Administration	Tropical Prediction Center	Website http://seahorse.nhc.noaa.gov/pastall.shtml?text
Federal	National Oceanic and Atmospheric Administration	Satellite and Information Services (NESIS)	Website http://www.nesdis.noaa.gov/
Federal	Geological Survey	Lamont Doherty Laboratory – Earthquake Data	Website http://www.ldeo.columbia.edu/research/ databases-repositories
Government / Private	The Disaster Center	Hurricane Floyd Tracking Map	Website http://www.disastercenter.com/hurrican/FloydTrc.html

Private (Academic)	University of Nebraska	National Drought Mitigation Center	Website http://drought.unl.edu/
Private (Journalism)	Laredo, Texas Morning Times	Article on Earthquake in Upstate New York, April 21, 2002, Page 10A	Website http://airwolf.lmtonline.com/news/archive/042102/pagea10.pdf
Private	Geographical Society of America	Article on Upstate New York Earthquake, April 20,202	Website http://gsa.confex.com/gsa/2008NE/finalptogram/abstract_133814.htm
Private (Academic)	Colorado State University	Impacts of Temperature Extremes	Website http://sciencepolicy.colorado.edu/socasp/weather1/adams.thml
Private (Academic)	The Journal News	Article: "Tonado Slams Region"	Hard Copy
Private (Journalism)	Columbia University	Science Earthquake Codes Adopted	Website http:www.columbia.edu/cu/record/archives/vol20/vol20_iss19/record2019.18html

APPENDIX H – MINUTES OF HMPC AND OTHER MEETINGS

A listing of the HMPC and Public meetings is shown on Page 21 of the Planning Process Section in Table 3-2 Hazard Mitigation Planning Committee Schedule and Topics. The agendas / minutes of those meetings follow in chronological order.

Additionally, several meetings were held with municipal staff in order to gather basic data about municipal infrastructure, assets and capabilities. The meetings were held as follows:

Date	Municipal Department
April 9, 2013	Public Works
Xx/xx/xxxx	Public Safety
Xx/xx/xxxx	Planning

APPENDIX I – STAKEHOLDER AND PUBLIC COMMENTS

Public Participation

There were several points during the drafting of the City of White Plains Multi-Hazard Mitigation Plan where the general public, business owners and municipal officials from surrounding municipalities, as well as other agencies who operate and maintain facilities within the municipal boundaries of the City had an opportunity to ask questions and receive answers relative to the proposed plan. Questions raised by the committee representing the various Neighborhood Associations were part of the overall discussion at the meetings and not specifically identified as stakeholders or public comments.

The Questionnaire that was available both in hard copy at City Hall, 255 Main Street, White Plains, NU, 10601 and the City's website (See Appendix D), had a total of thirty-two (32) additional stakeholders and public comments beyond those asked in the questionnaire. Twenty-two (22) related to the seven (7) natural hazards identified in the plan are indicated in the following Table.

Hazard Comments	Flood	Severe Storm	Severe Winter Storm	Extreme Heat	Drought	Earthquake	Dam Failure
Number / Hazard							

Other stakeholder and public comments generic to the planning process as well as other hazrds are listed in the following Table.

Concern Comments	Terrorism or Manmade Hazards	Need For Better Public Education	Need For Better Tree Maintenance	Inter-Agency Communications	Stormwater	All Hazards
Number / Hazard						

Hazard Related Comments And Their Incorporation Into The Plan

Flood

Severe Winter Storm

Earthquake

Terrorism or Manmade Hazards

Need for Public Education

Need for Better Tree Maintenance

Interagency Communications

Stormwater

All Hazards

Participation by local, State and Federal Agencies, Neighboring Jurisdictions

The Table below depicts agencies which could have had an interest in the City's Multi-hazard Mitigation Plan as well as municipalities which border the City. Of the six entities contacted, ___ had an interest in providing feedback to assist in the development of the City's Multi-Hazard Mitigation Plan.

Agency and Function	**Type of Outreach**	**Response to Outreach**
New York State Department of Transportation	Letter	
New York State Thruway Authority	Letter	
Town of North Castle	Letter	
Town of Scarsdale	Letter	
Town of Harrison	Letter	
Town of Greenburgh	Letter	

APPENDIX J – PUBLIC OUTREACH

Appendix J contains copies of mailings to municipalities and agencies which may have an interest in the City of White Plains Multi-Hazard Mitigation Plan being developed. This interest may be due to a municipality sharing a border with the City or that a portion of that agencies infrastructure passes through the City. Response by those municipalities and agencies is documented in Appendix I: Stakeholder and Public Comments.

Also contained herein is a copy of the letter from the Commissioner of Public Works to residence and businesses in the study area announcing the development of the plan, inviting participation by completing the questionnaire available in City Hall and the City's website.